CONTROLLING STREAM BED EROSION: AN APPLICATION FOR GABIONS

by Roger Bell

A word about the author:

Roger Bell received his Bachelor of Science degree from the University of Wisconsin at Madison specializing in Turf Management. He is currently the Golf Course Superintendent at North Shore Golf Club in Menasha, Wisconsin, a position he has held for the past six years. He is married and the father of two sons.

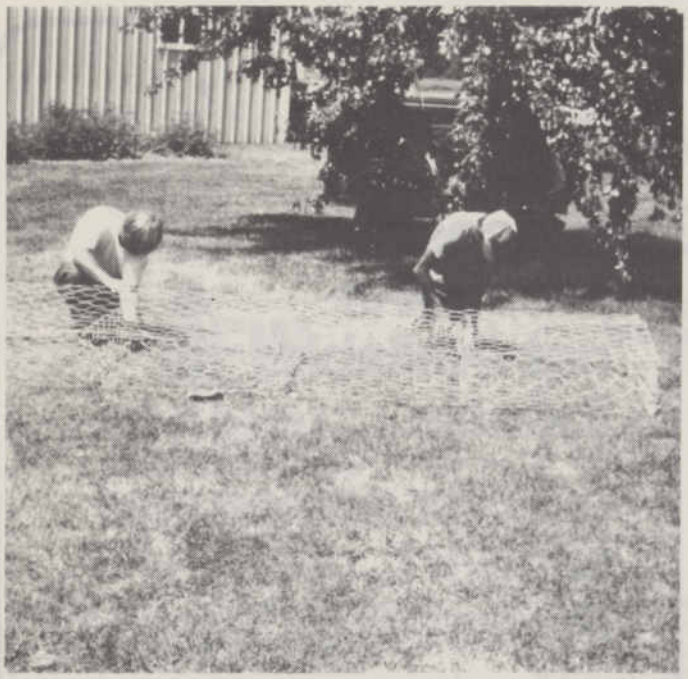
The word gabion is derived from the Latin "cavea," meaning cage. Modern day gabions fit this description well: they are compartmented rectangular containers made of hexagonal galvanized steel wire mesh filled with stones. When appropriately placed in a stream bed they are an excellent means of controlling erosion.

North Shore Golf Club is a private, 160 acre, 18 hole golf course with a small stream running through it. The stream carries run off from a 1700 acre watershed and varies from a small river with spring run-off to a mere trickle during the summer. Three of the golf cart and equipment-carrying bridges across this stream were in danger of collapse because the soil erosion in the stream bed was undercutting their support columns. The soil at North Shore can be described as heavy clay. Such a clay soil characteristically creates a 2 to 1 slope of the stream bank. (This 2 to 1 slope means that for every drop of one foot in the stream bed, two feet of the stream banks will collapse into the bed, leaving such things as bridge supports exposed.) To complicate matters, the stream bed is narrow under the bridges resulting in maximum water velocity at that point which increases the downward cutting into the stream bed.

Several solutions exist to the problem of maintaining the bridges: driven pile and plank abutments could be built or concrete abutments could be poured to reinforce the existing structures. Both these ideas were rejected, however, because (a) they were too costly, (b) they required the use of outside contractors using heavy equipment in vulnerable areas of the golf course and (c) they did not address the real problem at hand, namely, controlling the downward cutting into the stream bed.

Consultation with the U.S.D.A. Soil Conservation Service in Calumet Country and with Dr. Arthur Peterson, Soils Professor at the University of Wisconsin at Madison, confirmed the best solution would be to use gabions to stabilize the stream bed and coincidentally the bridge supports.

Gabions are purchased in two thicknesses: 12" (x 3' x 9') for the base mat and 18" (x 3' x 6' or 9') for the side walls. They come folded flat, color coded for size and require assembly into the basic cage configuration using lineman's pliers, extra large channel locks (or comparable tools) and galvanized wire (.0944"). Assembly is most easily accomplished by two persons working in a convenient location (off-site). The tops of the gabions are left not wired shut so rocks can be added once the gabions are in place. The installation of the base is most critical since it is what contains the downward cutting into the stream bed. The bottom of the stream is leveled to the desired elevation and the 12" thick assembled gabions are moved in and laid flat across the bed, all of the gabions being securely wired together. The base gabions are filled with rock and wired shut. Although the Soil Service recommends breaker run limestone (size 5" to fines) for use in filling the gabions, 3" to 6" broken concrete can be used a s well. It is wise to hand fill exposed areas for aesthetic appeal. The side foot for every 6 feet of height. These side



Assembling the gabions before transporting them to installation site.

Rock-filled gabions in place.

gabions are filled with rock and wired shut before the next layer of gabions are wired in on top and so forth, until the desired height is reached. As each layer of gabions is completed, the area behind them should be back filled and compacted. At North Shore, once the gabions were secured, new concrete pillars were poured behind the gabions to replace those that had suffered erosion damage. These pillars had steel plates installed on their tops, making it possible to weld the bridge beams to these plates.

Materials and labor for use in constructing sufficient gabions for one bridge are estimated to be: (a) approximately $1000 for gabions, (b) approximately $500 for rock, and (c) approximately 250 person-hours labor. A list of suppliers can be found at the end of this article.

The first gabions were installed and bridge re-fortification completed at North Shore in 1979. To date, the results have been excellent: the erosion of the stream has been effectively controlled, the bridge in question remains stable and the results have been esthetically acceptable to club members.

Roger C. Bell
Golf Course Superintendent
North Shore Golf Club
Menasha, Wisconsin

APPENDIX

List of Suppliers:

Terra Aqua Conservation
(most competitive bid)
4930 Energy Way
Reno, Nevada 89502
(702) 329-6262

Maccaferri Gabions, Inc.
One Lefrak City Plaza
Flushing, N.Y. 11368
(212) 736-4715

Wessel-Duval and Co., Inc.
(Charles Picarelli)
One World Trade Center
New York, N.Y. 10048
(212) 432-1940