

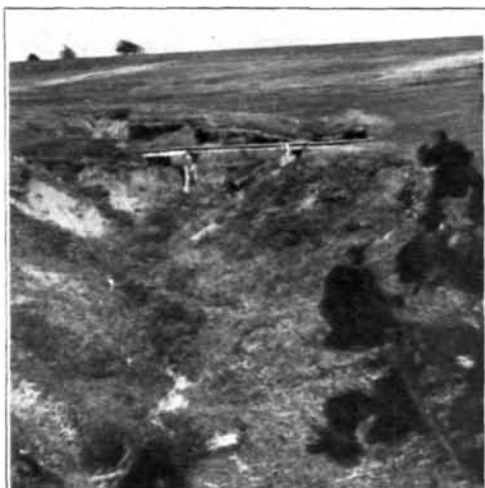
Checking Gully Erosion on Golf Courses

By R. E. Uhland

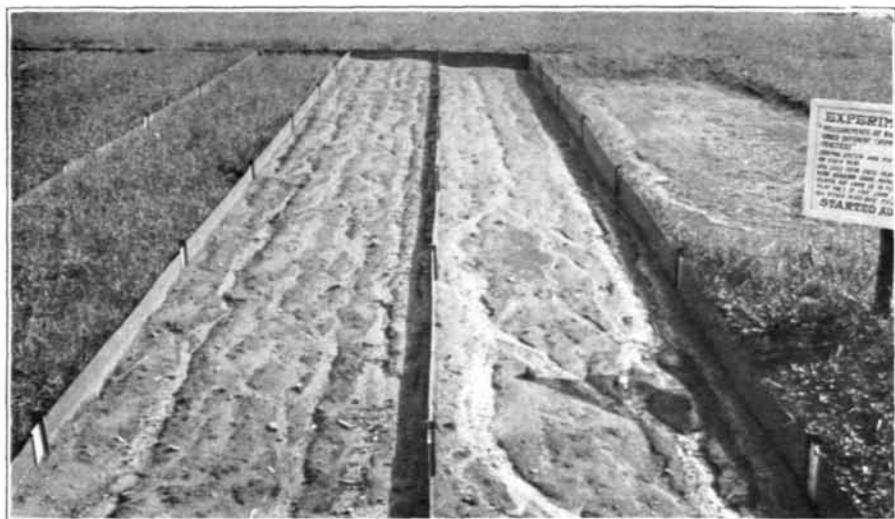
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No one will deny that good greens and fairways are essential to a good game of golf. It is unfortunate to find numerous ditches or gullies of variable sizes crossing golf courses, yet we find many of them. These washes not only provide unwarranted and annoying hazards, but are objectionable because they increase steadily, both in size and number, unless they are constantly watched. Many originally attractive courses have been practically ruined because these gullies were not checked when they were small.

Although soil erosion has been going on since the beginning of time, it is only recently that the United States Department of Agriculture and the state institutions have inaugurated a thoroughgoing program of research relating to ways and means for controlling this costly, man-induced evil. Fully 75 per cent of the agricultural lands in the United States are suffering in some degree from erosion. Cultivating the soil intensifies erosion in much the same manner that stirring a fire hastens its burning.



This unsightly gully on a golf course was caused largely by the runoff from a 12-acre cultivated field located above the course



The small plots on the right indicate how severely soil erodes when it is cultivated in the absence of a crop. In four months' time (June 1 to October 1) one of these plots lost soil at the rate of 86 tons an acre. During the same period grass plots lost less than $\frac{1}{2}$ ton an acre

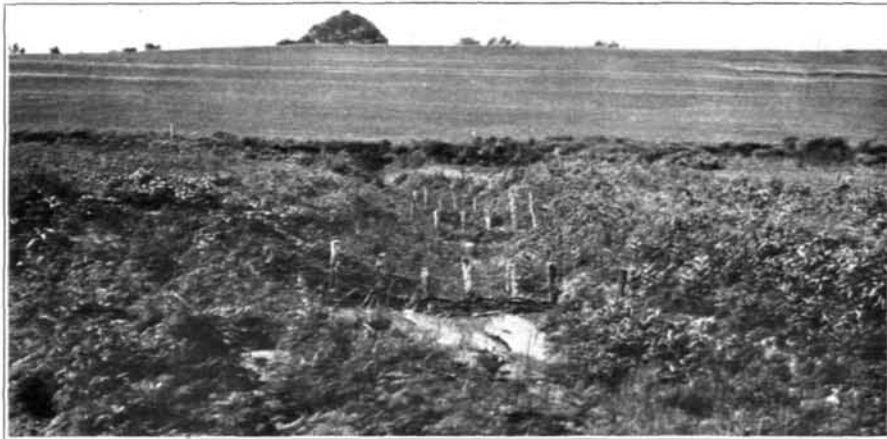
It probably can be safely estimated that at least 80 to 90 per cent of the golf courses of the United States and Canada are located on land which, if cultivated, would quickly suffer seriously from erosion. Many of the slopes are so steep that they would surface-erode and gully badly. Fortunately, however, golf courses are kept sodded. Grass has proved to be one of the most effective instruments we know of for controlling sheet erosion. Not only is the percentage of runoff from good grass land much lower than the loss of rain water from cultivated land, but the soil loss is extremely low, whereas on cultivated land it is alarmingly great. It is perhaps unnecessary to state that the better the growth of sod the more effective it is in checking runoff and erosion. Liberal fertilization of the course, particularly on the thinner spots, will aid materially in establishing a better mat of turf grasses, and at the same time decrease erosion. The particular fertilizer and rate of application will, of course, vary with the section of country and the kind of grass used, since the different grasses and the different types of soil may require different kinds of fertilizers.



The formation of gullies can be checked by sodded dams constructed by placing burlap bags filled with sod in any depression which serves as a channel for conveying the runoff from a field terrace on a higher slope. This is a wide depression and thus required a great number of bags

In the early spring when the frost begins to leave the ground and when the frequent rains occur, small gullies will form even on courses with such grasses as Kentucky bluegrass and the various bent grasses, especially where the slopes are steep and where large volumes of water accumulate. The use of barriers made of burlap bags filled with good sod of grasses similar to those used on the golf course will prove effective in checking these small gullies that have already developed and will aid in preventing others from forming. This is proving a cheap and effective method of checking washes in meadows, fields of small grains, and pastures in the Corn Belt, and should prove equally beneficial on golf courses of the same region, and probably also in many other parts of the United States. Old burlap feed or fertilizer bags are filled about one-third to one-half full of sod containing plenty of soil on its roots. The sod can best be cut in 8- or 10-inch squares 4 or 5 inches thick. The soil and roots should always be placed down and the grass up. After the bags are filled and securely tied they are

ready to be placed in the small washes or depressions where the water accumulates and where erosional cutting is likely to occur. The number of bags needed to form one of these barriers will vary with the size of the wash, but usually from three to five bags will make an effective barrier. In placing the bags in the washes, care should be taken to place the center bag or bags slightly downstream from the adjoining bags so as to be sure to keep the water in the center of the cut rather than send it around the sides. The best time to use these bags is in early spring. The grass soon grows through the coarse meshes of the bags and in a short time a dam is formed. By mid-summer the bag will no longer be noticed, as it will soon rot and waste away, leaving a sodded living dam which, if watched, will continue to hold the wash in check. This method of erosion control is discussed in United States Department of Agriculture Leaflet No. 82.



Woven-wire checks prove very effective in controlling gullies. Good fills have been secured above each of these barriers

There will be washes, however, which are too large for effective control with these sod barriers. In such instances barriers made of woven wire can be used effectively. As in placing the sod barriers, these woven-wire checks when finished should be V-shaped so the water will be directed to the center of the gully. A little straw or trash placed above will fill the meshes sufficiently to collect the soil that would otherwise be carried down the channel. If these checks are properly constructed and the posts painted, they need not detract from the appearance of the golf course.

Effective woven-wire barriers can also be made by simply stretching a heavy wire cable across the gully and attaching to it one end of the woven wire. The other end is placed upstream a few feet, where it is buried in the ground. The cable is left loose enough to allow the center to sag slightly and thus keep the water to the center of the gully. This type of gully-check is cheaply constructed and is an effective method of filling and stabilizing gullies.

If the gully has already attained such size that woven-wire checks obviously would not prove satisfactory, a soil-saving dam made of earth and supplied with a drop-inlet and culvert should be used. The

dam causes the water to pool above it and thus deposit its load of silt before the water flows into the upright entrance to the culvert. In constructing such a dam it is essential that the drop-inlet and culvert be of sufficient size to carry the maximum runoff to be expected from the watershed drained by the gully. By making the dam broad enough it can easily be used as a bridge. If a small drainage tile is run up the gully, along the bottom, some distance from the intake culvert, adequate drainage will be provided to allow grass to grow on the alluvial filling caught above the dam. In some places, especially where a dam is located near the boundary of a golf course, it may be preferable to allow the water to remain as a pond above the dam, since pools of this kind may actually add to the attractiveness of the grounds.



Large soil-saving dam in use on the Federal and State Soil Erosion Experiment Station near Bethany, Mo. A fill of more than 4 feet of soil has already formed above this dam

On soils which have soft substrata, gullies often work their way up the slopes into the golf courses from lower-lying adjoining areas. It is this type of gully that can not be controlled, usually, by processes of sodding, so that other control measures must be resorted to. The use of black locust trees in such washes proves quite inexpensive and effective. The banks should first be plowed off so that the slope is sufficiently reduced to allow the setting of the small seedling trees. These trees grow rapidly and if properly pruned will not only stabilize these steep and unsightly banks but will also allow grass to grow between them, which is not possible with most types of trees when they are set closely. By thus stabilizing the steep, unsightly banks, the progress of these gullies will be arrested. The checking of such large gullies will aid materially in preventing the formation of numerous smaller branching gullies.

On many golf courses the problem of erosion control is much more complicated because of the fact that areas adjacent to the course may drain down upon them, supplying sufficient extra water, flowing at

an accelerated velocity to cut out bad gullies, which are decidedly difficult to control. An example of such erosion is indicated by the picture on the first page of this article. A rather steep slope of about 12 acres which lies above this golf course had been cropped to corn annually for a number of years. As might be expected, this area had been eroded severely and the runoff water from the cornfield had been to a large degree responsible for the formation of the deep gully. This same difficulty has been noted on numerous courses throughout the Corn Belt states.



Use of black locust trees for stabilizing a bad gully on the Federal and State Soil Erosion Experiment Station near Bethany, Mo.

An effective way of preventing or checking such damage is to terrace the area above the golf course. A complication arises here, in that the field is seldom owned by the golf club. Many of the farmers who own land bordering golf courses can, however, be induced to terrace their land. Such a measure would not only render direct service to the farmer, by lessening the washing of his field, but at the same time would go far toward controlling excessive washing on the golf course. Undoubtedly there are many golf courses where the local club can profitably encourage such control measures. The club may even find it advisable to help finance the terracing of the adjoining field in order to divert any inflow of water which may greatly increase the hazard of gully formation on its grounds.

There may be cases in which it is impossible or at least impractical to get the cooperation of the landowner adjoining the golf course, thus making it necessary to resort to some other means of erosion control. In some places the construction of a diversion ditch inside the property line may prove advisable. The method for the control of this type of erosion trouble will naturally have to be worked out for the individual courses.

Rake up the dead leaves in the woods at the end of winter and put them in the compost piles.