



*The bentonite was carefully spaced in piles to insure uniform and complete coverage.*

## *How to Seal a Leaking Pond*

**by Ted Roberts Jr., Superintendent, Canoe Brook Country Club, Summit, New Jersey**

*In an earlier issue of the USGA Green Section Record, January, 1969, Elmer Michael and James De Bottis described their experiences using a plastic cover to seal the bottom of the lake at the Country Club of Rochester. This article deals with the use of bentonite, long recommended by the United States Department of Agriculture for sealing ponds. If you have a leaky pond, be sure to check with your local Department of Agriculture Soil Conservation representatives or county agents to see if bentonite will work on your soils.*

**T**he pond on the South Course of Canoe Brook Country Club was constructed many years ago of an earthen embankment and a partial retaining wall. Over the years the water level has been maintained at 8 to 10 feet above the existing terrain on the spillway side.

A series of leaks through the embankment had been increasing each year, and they became serious enough last year to require trenching in order to drain a large swamp area that had developed. When the pond was drained

last winter, we examined the general area but found not one small bit of evidence that would indicate water penetration of the wall or the embankment. But we knew that with the pond filled again, from spring rains we would have a return of the leakage problem.

Robert G. Smith, one of our observant golfers, had also noticed the problem. A vice president of one of the firms that distributes bentonite, he felt that he might be of some help. We reviewed the problem with two specialists



*This is the base of the pond after the bentonite was completely spread.*

from his firm, and as a result of the meeting we decided to try bentonite.

Bentonite is a special form of clay found almost solely in the Black Hills region of the United States. It differs from other clays in its molecular structure. Looking at an aggregate clay particle, one has to visualize millions of flake-like units which are thin platey particles of definite thickness lying layer upon layer. When water is added to these clay particles, it crowds between the individual flakes pushing them apart and forms a bond around them. The more water added the more flakes affected, resulting in a swelling of the clay particles. Without getting deep into the chemistry of the material, it is sufficient to say that it is affected by water. It absorbs nearly five times its weight of water and at full saturation it occupies a volume 12 to 15 times its dry bulk. On drying, it will shrink to its original volume, the flat plates contracting together in accordion fashion.

As a simple test to demonstrate the effectiveness of bentonite, take a can, puncture holes in the bottom, and then add an inch of gravel or sand to the can. Pour water in and it will drip out of the holes. Cover the gravel with a

half-inch layer of bentonite and add another layer of gravel over the bentonite. Fill the remainder of the can with water and see if it will penetrate to the bottom. You will find that the bentonite barrier holds the water back.

After deciding to try bentonite we studied methods of applying it. There is a powdered material and various sizes of granular materials. We were advised to use the granular material KWK.

Three methods of sealing leaking ponds were suggested: mixed blanket, pure blanket, and sprinkle.

The mixed blanket method involves spreading the material over an area, then harrowing or raking it into the top three or four inches of soil, followed by rolling. The pure blanket method involves spreading a layer of material over the soil and covering it with three or four inches of soil, sand or fine gravel.

Sprinkle method is simply scattering the clay particles on the surface of the pond when full and allowing them to sink to the bottom where they swell.

In all methods the resultant gel (that forms as the clay absorbs water) is drawn into the



leaky seams. The gel clings to soil particles and builds up an impenetrable barrier to the water flow, thus stopping the leak.

We chose to try the mixed blanket method. After clearing the bottom of debris and large stones, we found it still too moist to work the existing soil satisfactorily. The fact that we would soon have to fill the pond and the possibilities of rains keeping the soil wet forced us to try and spread a pure blanket of the material over the bottom and inside slope.

It had been suggested that we apply three pounds per square foot. We used over four pounds. The area was marked off in squares sufficient in size to take a full bag of material. This made it easy to spread by rake as each bag was spilled in individual squares. As mentioned earlier, the muck bottom was too moist to work. We simply covered the corner area where the leaks persisted and closed the gate to allow the pond to fill.

It was interesting to watch the material as the water reached it. The first day it appeared to have many small burrows as though worms were tunneling through it. After about four days of water coverage, the burrows had enlarged greatly, looking like tunnels a muskrat might make. It was an ugly looking mess for a while.

Constant checks of the seepage area revealed

at first the flow of water, but in about a week from the time the pond had completely filled, all areas had stopped seeping but one. Eventually it stopped, but started again a few weeks later for a short period and then dried up. A couple of times we have found indications of slight moisture, but no real leak. It appears now that this moisture is coming from a nearby green and sand trap that drain to the area, and not from the pond.

We are about ready to cover the ditch and cross off one more problem solved on the golf course. If you have a similar problem, give bentonite a try; you may be surprised at the results.

#### THE AUTHOR

Ted Roberts' interest in golf course maintenance and management began early; his father was Superintendent at LuLu Temple Country Club in Philadelphia. Roberts is currently a USGA Green Section Committeeman; he is a Past President of the Golf Course Superintendents Association of America and of the Philadelphia Association of Golf Course Superintendents. He has written many articles on golf turf care and is a sought-after speaker at turfgrass conferences.

## SUPER SAM

by Paprocki

