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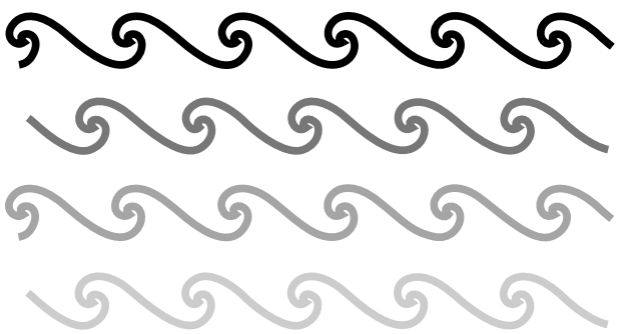
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**Ponds
and
Lakes
with Bentonite**

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Water seeping into permeable subsoils may cause rapid loss of water from ponds, lakes and reservoirs. Such seepage losses often can be reduced or eliminated by using bentonite to seal the bottoms of ponds. Bentonite is a natural clay with excellent swell characteristics. When wet, it expands to 10 to 12 times its dry size. When applied in sufficient volumes, bentonite can form a layer that is impervious to water. It is easy to apply with ordinary farm equipment and does not affect water quality.

Application Methods

Bentonite works best when it is applied directly to the soil in the bottom of a pond using the blanket method or the mixed blanket method. If it is impractical to drain the pond, the sprinkle method can be used. When sprinkled on the surface of the water, bentonite then settles to the bottom.

The Blanket Method

When done correctly, the blanket method usually produces more effective seepage control than the sprinkle method. In the blanket method, a layer of bentonite (fine or pulverized grade) is placed on the bottom of the pond. Then, a soil cover is placed over it, as shown in Figure 1.

Carefully prepare the area to be treated. Remove the top 4 to 6 inches of soil from the pond, lake or reservoir. Fill deep holes or crevices with a mixture of 1 part bentonite to 5 parts soil. Smooth the surface with a roller or drag. Cover the area with a layer of bentonite. (See below for determining the amount.) After spreading the bentonite evenly, replace the 4 to 6 inches of soil carefully to avoid disturbing the layer of bentonite.

For best results, bentonite must be spread evenly. Mark the treatment area in squares 10 feet by 10 feet as shown in Figure 2. Place the required number of bags of bentonite in each square. Treating at the rate of 1 pound per square foot will require two bags of 50 pounds each in each square (each square contains 100 square feet). Large ponds or lakes may require the bentonite to be delivered to the site in bulk quantities. Spread the bentonite evenly over each square. Bare spots may allow seepage

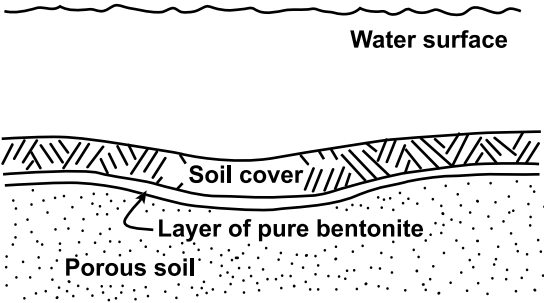


Figure 1. Blanket method.

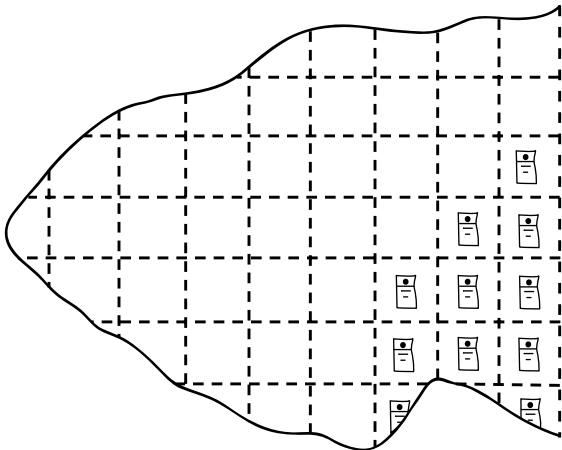


Figure 2. Reservoir layout.

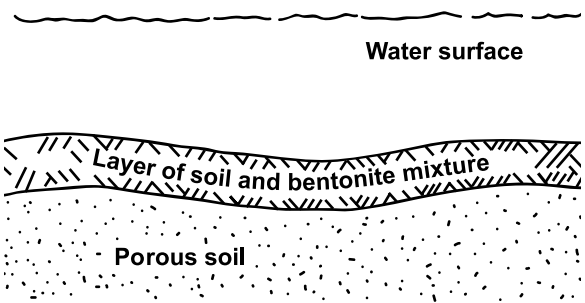


Figure 3. Mixed blanket method.

to continue. Cover the bentonite layer carefully to avoid developing holes in the impermeable layer.

Compact the topsoil by rolling or tamping. If possible, control the flow of water when filling the pond to prevent damage to the treated surface. Several days may be required for the bentonite to become saturated and fill the permeable voids in the soil. If livestock are expected to walk in the pond, the cover layer of soil must be thicker than 4 inches. A cover layer of gravel is an ideal finish to protect a bentonite layer.

The Mixed Blanket Method

The mixed blanket method is shown in Figure 3. First, remove all rocks and vegetation from the bottom of the pond. For best results, have the soil just moist enough to be plowed or disked easily. Plow or disk the pond bottom and drag the surface until it is smooth. This preparation makes the top 4 to 6 inches of soil uniform so the bentonite can be mixed evenly with the soil. Mark the area in squares 10 feet by 10 feet, and spread the required amount of bentonite as described for the blanket method. Mix the bentonite with the top 4 to 6 inches of soil with a disk harrow, spike-tooth harrow or by hand-raking. Compact the surface by rolling or tamping. No cover coat is needed.

The mixed blanket method may be less effective than the blanket method because of uneven mixing of the bentonite. The disking operation sometimes leaves strips or spots where the bentonite concentration is too low. Increase the amount of bentonite to minimize this possibility.

The Sprinkle Method

In situations where a pond cannot be drained, the sprinkle method may be used. This method requires coarse bentonite (crushed or granular grade). The coarse particles are scattered on the surface of the water and then allowed to sink to the bottom. As the bentonite swells, it forms a gel that is drawn into the more porous areas of the pond bottom. The water-resistant layer that forms reduces the seepage from these areas. Figure 4 shows one way of applying bentonite in this manner.



Figure 4. Sprinkle method.

The sprinkle method is less effective than other methods. Accurate, uniform placement of bentonite is difficult to accomplish. This method is not recommended for ponds where livestock may wade in the water and disturb the bentonite layer. The sprinkle method is useful in emergencies when isolated leaks need to be stopped. Spots known to be especially porous should be treated first. Spot treatment may reduce water loss enough that the entire bottom will not require covering.

Sprinkling bentonite in the water will cause a slight temporary cloudiness; however it is not harmful for drinking purposes.

Amount of Bentonite to Use

The amount of bentonite required to effectively reduce seepage losses from a pond or lake varies from 1 to 2 pounds per square foot of soil surface. One-half pound of bentonite per square foot of soil is usually satisfactory when the bottom of the pond is fine sand or sandy loam and the maximum water depth is less than 6 feet. With the same type of soil and a water depth of 6 to 20 feet, increase the rate to 1 pound per square foot. In general, coarse soils require more bentonite. Greater water

depths increase the pressure on the bottom of the pond and require more bentonite.

How to Determine the Required Amount of Bentonite
Perforate the bottom of a bucket, can or small drum and place 1 or 2 inches of gravel in the bottom. Cover the gravel with 6 or 8 inches of typical soil from the area you intend to treat. Tamp the soil, fill the container with water and observe the rate of water seepage.

Repeat the procedure described above using the bentonite application method you plan to use in the pond. If you plan to use the blanket method, apply a blanket of bentonite over the soil sample in the can, cover with 3 or 4 inches of soil and fill the can with water. If you plan to use the sprinkle method, apply the bentonite by sprinkling it on the water surface after you have filled the can with water. Observe the seepage rate through treated soil.

Try an application rate of $1/2$ pound of bentonite per square foot. Repeat the procedure until you find the minimum amount of bentonite required to prevent or reduce water seepage to an acceptable rate. After determining the minimum amount of bentonite needed, add 25 to 50 percent more to allow for greater water depths in the pond or reservoir and challenges with even distribution during the treatment process.

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