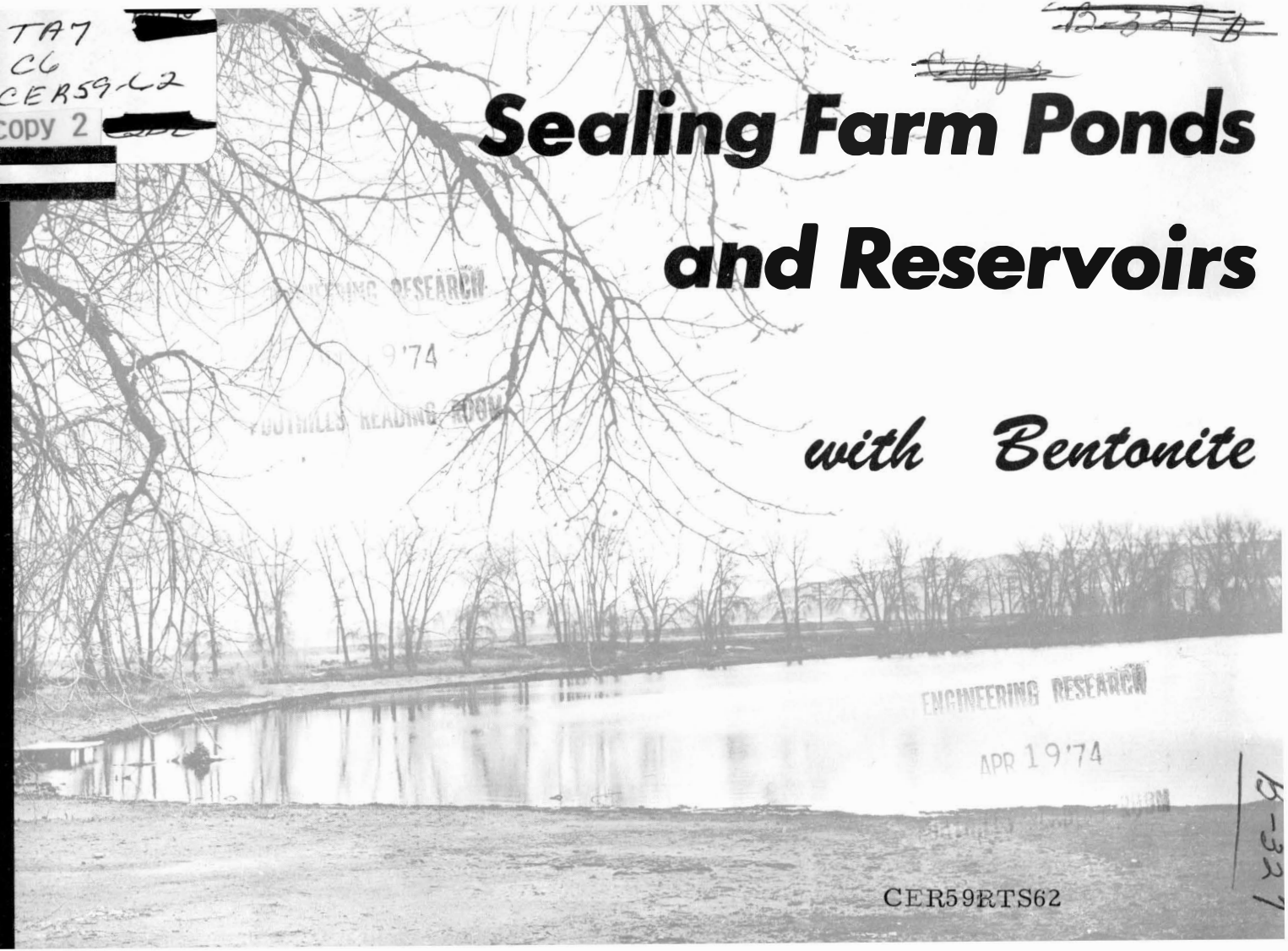
Sealing Farm Ponds and Reservoirs with Bentonite



Colorado State University • Extension Service
Circular 206-A
Fort Collins

This booklet is intended as a practical guide for pond owners and reservoir operators. It summarizes the information available from research institutions and bentonite companies on pond sealing with bentonite. It includes material developed at Colorado State University in the field of low-cost canal sealing with clay sediments, which has been an active research project under R. D. Dirmeyer, Jr., project leader, since July 1953. This research is sponsored by the Colorado Agricultural Experiment Station and the Colorado State University Research Foundation in cooperation with other organizations, including the U. S. Agricultural Research Service and many irrigation districts and private companies.

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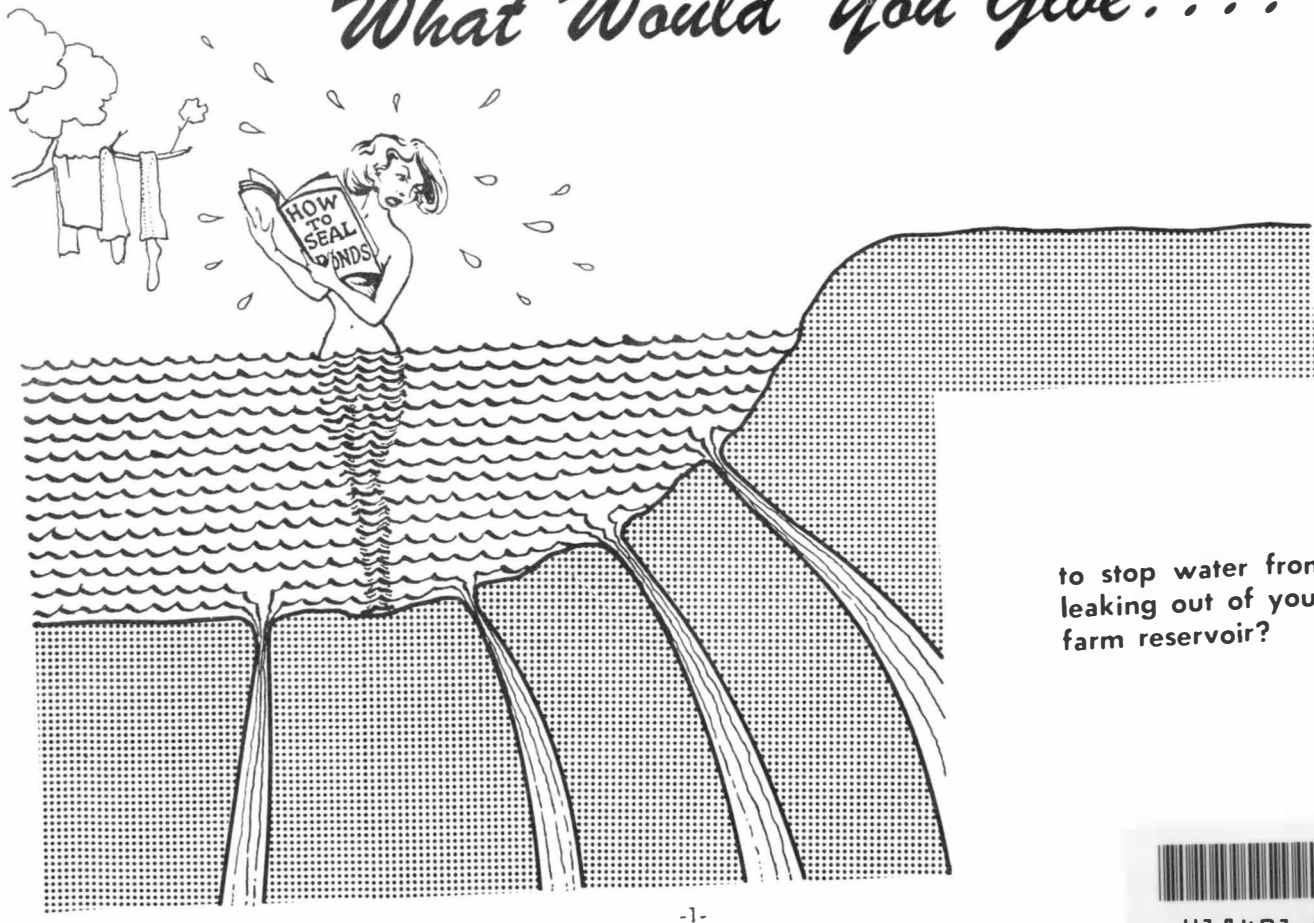
What Would You Give....



to stop water from leaking out of your farm reservoir?

Have You Tried Using Bentonite ?

- Do you want to stop the seepage loss from your pond?
- Do you want to save the seep-damaged land near your pond?
- Do you want to line your farm pond at low cost?

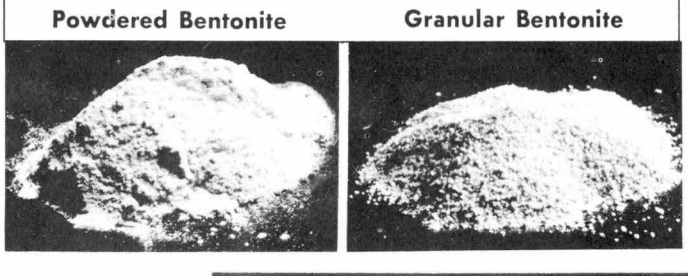
Bentonite may be your answer

EFFECTIVE—Bentonite is a clay material which can impede water passage. When used properly, it can reduce water leakage from your pond. It works best in silty and sandy soils.

ECONOMICAL—Bentonite is mined from natural deposits in Wyoming and other western states. Its price is reasonable, largely dependent on transportation cost.

SIMPLE— Bentonite can be applied with minimum special equipment and skilled labor. Generally the equipment available on a farm is enough.

HARMLESS— Bentonite is harmless to animals and fish. It is commonly used in the preparation of poultry and stock feeds as well as human foods and medicine.



Good high-swell bentonite works best in most sealing jobs. It can be powdered or granular. Powdered bentonite costs less, but it is dusty. Granular bentonite has little dust, spreads easily as a blanket, but costs more.

To select bentonite, read our circular on "Testing Bentonite"

More Ways to Skin a Cat

You can apply bentonite to a dry pond, to a pond full of water, or in a cut-off wall along one end of the pond.

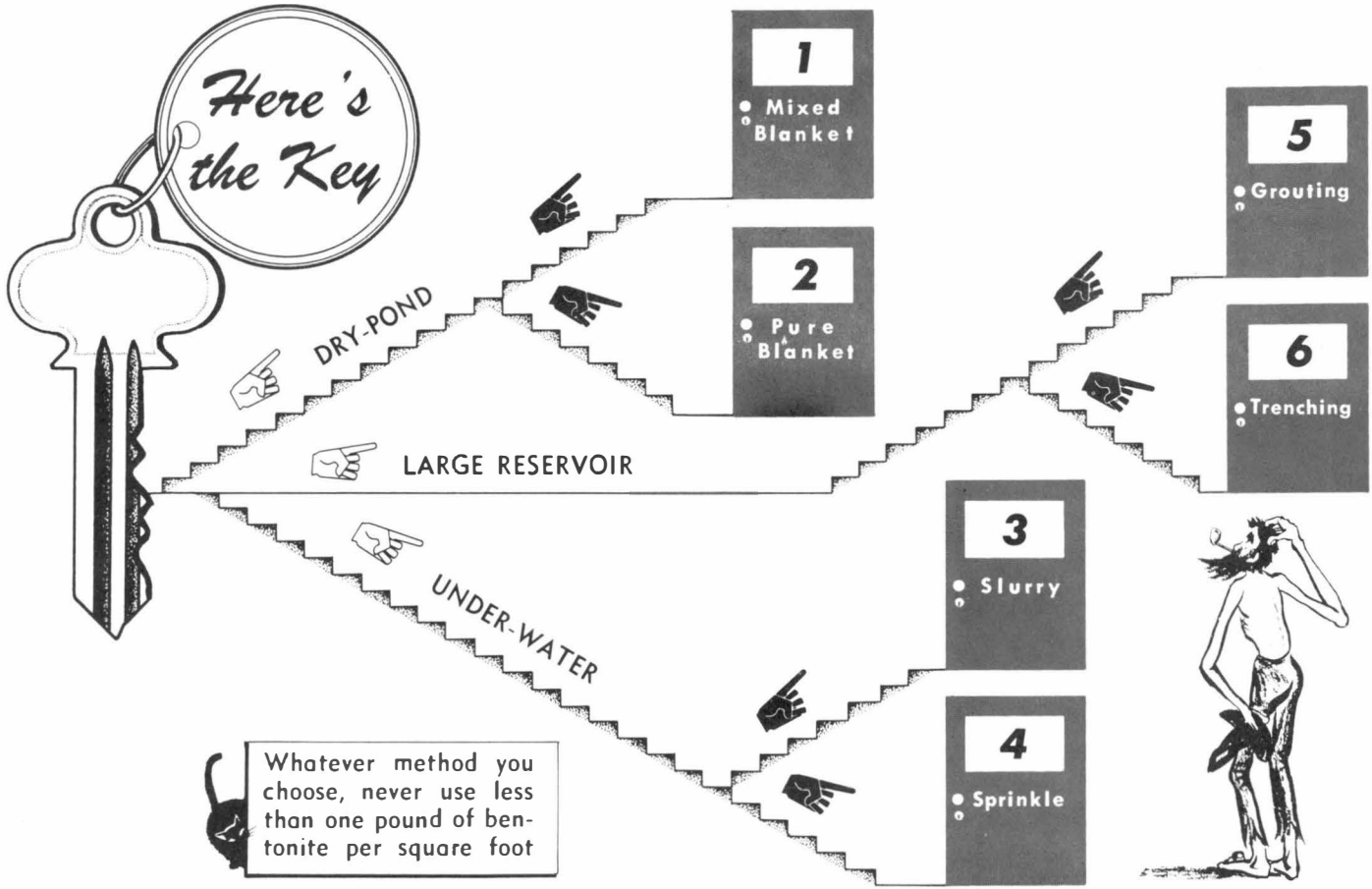
The Dry-Pond Method is a standard method, often recommended in the past. You cover the bed area with a uniform blanket of bentonite. This can be a pure bentonite membrane buried under a protective cover of soil, or a compacted layer of bentonite-soil mixture.

The Under-Water Method concentrates the bentonite in the leaky zones. You can save on labor and at the same time use your bentonite efficiently. After the bentonite is added, underwater harrowing helps to mix the bentonite into the bed material.

The Cut-off Wall Method is used when the reservoir is so big that a bottom lining becomes uneconomical. This operation is on a comparatively large scale, and requires experienced personnel.

- Consider your reservoir conditions
- Compare the different methods
- Consult an experienced specialist

Choose a way that will fit your job best


Here's the Key
DRY-POND
1
Mixed Blanket
2
Pure Blanket
LARGE RESERVOIR
5
Grouting
6
Trenching
UNDER-WATER
3
Slurry
4
Sprinkle
Whatever method you choose, never use less than one pound of bentonite per square foot

The Dry-Pond Methods

This method can be used when your pond bottom can be drained and dried. Divide your pond area into 10-foot squares (100 square feet each) and place one sack (100 pounds) of bentonite in each square. Where the bed consists of loose sand, use more bentonite. If the whole bottom needs more bentonite, you can simply mark off smaller squares. For example: 7-foot squares will double your bentonite concentration.

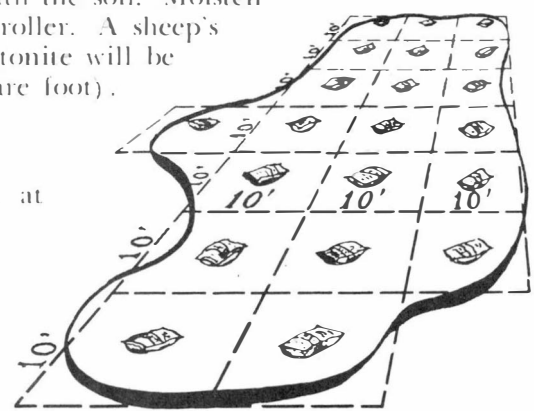
1 Mixed Blanket

Mixed Blanket (the preferred dry-pond method)
Spread out your bentonite evenly. Mix by harrowing or some other method until the bentonite is well blended with the soil. Moisten the whole area, and compact with a smooth roller. A sheep's foot roller will do a better job but more bentonite will be needed (a minimum of two pounds per square foot).

2 Pure Blanket

Pure Blanket

Spread out your bentonite evenly, and add at least four inches of soil to cover the area. Moisten and compact these layers as much as practicable before filling the pond with water.



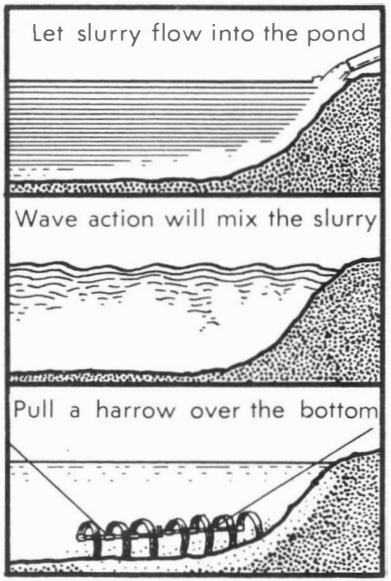
Use the Mixed Blanket if the water is hard or the pond dries periodically

The Under-Water Methods

This method can be used without draining your pond, but the pond bottom should be flat enough for harrowing or for some other method of breaking up the soil surface. It works best when the pond is fairly shallow and not too large.

3 Slurry

Slurry (the preferred method)



Mix powdered bentonite into water to make a smooth, well-dispersed slurry. (For detailed procedure, read our circular on "Mixing Bentonite.")

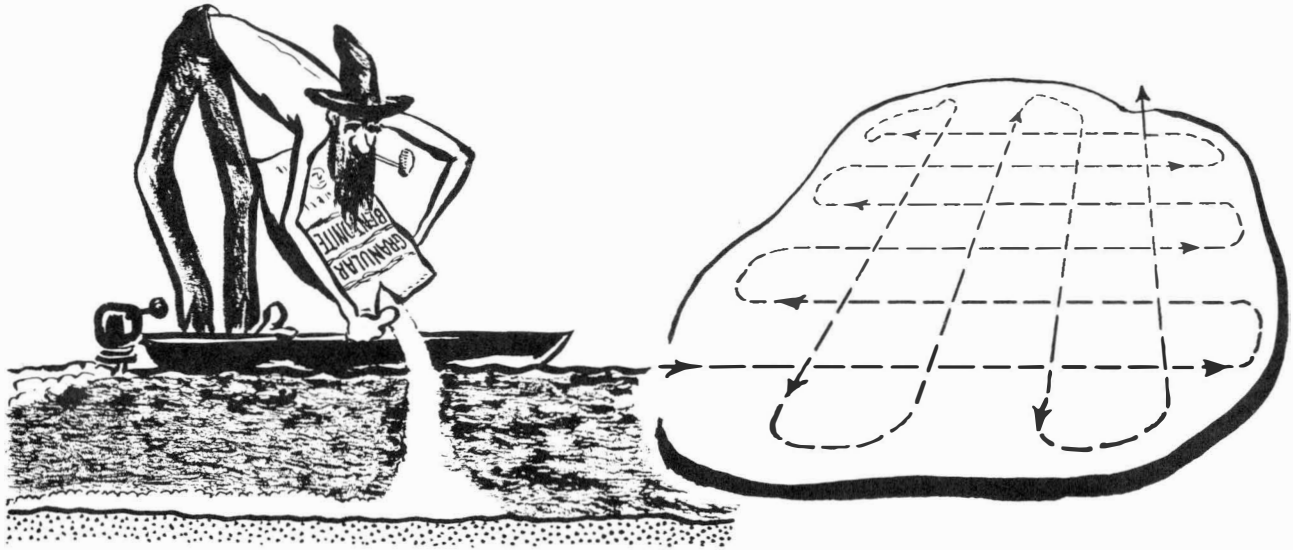
- Let this slurry flow into the pond water. Because the slurry is heavy it will spread out, under the clear water, over the whole bottom area.
- Wave action will mix the slurry into the clear water until the whole pond becomes milky.
- Pull a harrow over the bottom until the bentonite is well mixed into the bed material.

Keep the pond filled with water for at least two months afterward

4
Sprinkle

Sprinkle

- When you lack mixing equipment, you may sprinkle granular bentonite from a boat.
- Follow a pattern to cover the entire pond area and try to sprinkle at a uniform rate.
- After sprinkling, pull a harrow over the whole area. Keep the pond filled with water for at least two months.



Sprinkle to supplement the slurry method wherever desirable

The Large Reservoir Methods

If your reservoir is very large, a complete bottom sealing will be uneconomical. You may use the grouting method or the trenching method.

5 Grouting

Grouting

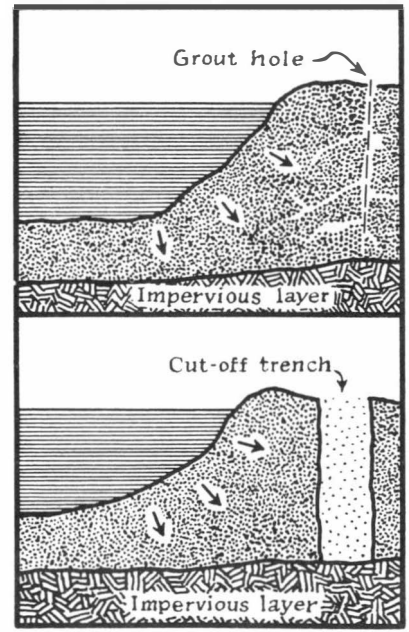
Drill a series of holes along the seepage zone and inject bentonite slurry into them. Pressure forces the liquid to fill up all the voids to form a wall against the seeping water.

6 Trenching

Trenching

Dig a trench along the seepage zone. Fill it with bentonite slurry as you dig. The bentonite will keep the sides of the trench from caving in. Backfill the trench with the excavated bed material to make a wall of soil-bentonite mixture.

This is known as the Cronese method.



Obtain professional help for this type of work

More Information . . . .

Q. 1. How good is the bentonite seal?

Ans. As good as you make it. An 80 percent or better seal can be attained by careful planning and competent installation.

Q. 2. How long will the sealing last?

Ans. A good installation will probably last twenty years or more.

Q. 3. What is a good bentonite to use?

Ans. Commercial, high-swell bentonite is the best for most cases. There are standard tests available to determine the suitability of bentonite. (See Circular 205-A.)

Q. 4 Can bentonite seal gravelly and rocky bed materials?

Ans. Gravelly bed material needs more bentonite than sandy material. If the material is very open and rocky, in addition to high-quality bentonite, some binding material is needed, such as coarse bentonite, silt, and even sawdust. Get some professional advice to determine your-specific need.

Q. 5. How can I mix a smooth bentonite slurry?

Ans. Various devices for mixing bentonite are described in a separate Circular (204-A).

Q. 6. How can I treat a few leaky spots in my pond without covering the entire pond?

Ans. Use the sprinkle method. Two other spot-treatment methods are described in Circular 204-A. If the pond is dry, the mixed blanket or pure blanket can be used.

Q. 7. What will hard water or repeated and severe drying do to the bentonite sealing?

Ans. The pure blanket will fail by shrinking and cracking. The mixed blanket will usually survive these conditions. For extreme cases, a low-swell bentonite may be more satisfactory than a high-swell bentonite. (For a complete discussion see Circular 205-A.)

★ For additional information, get in touch with your county agricultural agent or write to:

Project Leader
Canal Sealing Investigations
Colorado State University Research Foundation
Fort Collins, Colorado

or

Irrigation Specialist
Colorado State University Extension Service
Fort Collins, Colorado

Other publications on the use of bentonite for sealing purposes:

- Sealing Sandy Ditches With the Bentonite Dispersion Method—Circular 202-A
- Sealing Rocky Ditches With the Bentonite Multiple-Dam Method—Circular 203-A
- Mixing Bentonite for Sealing Purposes—Circular 204-A
- Testing Bentonite for Sealing Purposes—Circular 205-A