

Alternative Livestock Watering: Covered Concrete Waterer

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Waste Management
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*Livestock Environmental
Stewardship Series*

Overview

Alternative water sources offer environmental stewardship and animal health benefits to livestock producers. Documented long-term benefits from limiting or eliminating animal access to farm ponds include: improved water quality for livestock, reduced disease transmission, no risk of animals falling through ice, and longer pond life. Other likely benefits include: higher rate of gain and reduced energy use from a freeze-resistant waterer.

Research shows livestock prefer water facilities in the following order: tank or trough, pond, pool in stream, and flowing point on stream. Palatability and water temperature have been shown to greatly influence water consumption. Animals, like people, drink more when better water is available. Feed consumption is also related to water consumption.

A remote waterer, instead of livestock drinking from a pond, provides cooler, cleaner, fresher water and eliminates livestock damage to the pond edges, spillway, and dam. Wading in the drinking source creates muddy, bacteria-contaminated water. Fencing the pond and dam prevents animals from standing in the water, thereby lengthening the life of the pond. The fence should be designed and built to exclude all livestock. Thirty feet of grass buffer inside the fence protects the pond by filtering runoff and capturing most of the silt and contaminants before they reach the pond.

The ideal time to install the pipeline for a remote waterer is when the pond is being built, rebuilt, or cleaned. Perhaps the easiest way to install a new pipeline into an existing pond is to trench over the dam, lay the pipeline to the waterer, and create a siphon. This method causes the least damage to the pond and dam. However, many livestock producers do not like the siphon system because it can lose prime without notice. Most prefer to install a positive gravity flow system, as described here.

Installing a Remote Watering System

Overview

This publication describes step-by-step installation of an alternative livestock waterer for a pond in Ellis County. The project was led by K-State's Kansas Environmental Leadership Program (KELP) 2004 Applied Leadership Project Team. The concrete waterer consists of a mostly underground tank with a small exposed trough area. The tank portion is buried under about three feet of soil.

Step 1: Select the Best Site

Locate the best site for a waterer below the pond dam. The distance from the dam is not as critical as adequate drainage and proper orientation to the sun. An ideal site is well-drained with a southern slope for solar warming. A waterer protected from winter wind is more desirable for livestock.

Step 2: Plan and Design the Pipeline

Use flags to mark the pipeline route from the pond to the waterer site. The route may go around one end of the dam or through it. For the installation pictured in this publication, the producer chose to use the spillway, staying close to the pond edge (dam side) of the spillway. A pipeline located through the spillway reduces trench depth and possibly length, but creates an increased risk of erosion.

Measure the distance from the pond intake to the waterer site following the pipeline route as marked. Use a surveying level to determine the difference in elevation from a low water level in the pond to the waterer site. Plan for the water level at the waterer to be 12 inches above the top of the pad.

Step 3: Calculate Water Use and Pipe Diameter

Determine how many gallons per day (gpd) of water are needed. Multiply the number of animals with access to the water by the gpd for the animal size and temperature from Table 1. Choose the pipe diameter to supply the total water needed in 4 to 8 hours. Calculate maximum friction loss (FL) by dividing the elevation difference (from Step 2) by the pipe length in 100s of feet. Avoid too large of pipe because sediment deposits in the pipeline. Tanks of less than 50 gallons to 500 gallons are available. A larger tank will serve more animals with a smaller flow rate and reduced freezing.

Example: For 120 cow-calf pairs at 20 gpd (Table 1):

$$FL = 8 \text{ ft. drop} \div 7 (100 \text{ ft.}) = 8/7 \text{ ft}/100 \text{ ft} = 1.15 \text{ ft}/100 \text{ ft}$$

$$120 \times 20 \text{ gpd peak rate} = 2,400 \text{ gpd (gallons per day)}$$

$$2,400 \div 6 \text{ hours} = 400 \text{ gph (gallons per hour)} = 6.6 \text{ gpm (gallons per minute)}$$

With this information (6.6 gpm at FL 1.15 ft/100 ft) your pipe supplier can help you select the diameter needed. (From Chart 1, page 4, a 1½-inch pipe is required.)

Table 1. Water requirements (gpd) for cattle based on production phase and temperature.^a

Air temperature	40°F	60°F	80°F
Growing cattle @ 800 lb	6.3	7.9	10.6
Finishing cattle @ 800 lb	7.3	9.1	12.3
Wintering pregnant cows	6.0	7.4	----
Lactating cows	11.4	14.5	17.9
Mature bulls @ 1600 lb	8.7	10.8	14.5
Cow/calf pair (estimate)	12	16	20

^a National Research Council, 1996

Step 4: Dig the Trench



The trench should be about 4 feet below the pond's water level at all points to protect the pipeline from freezing and to maintain water flow. To assure gravity flow, the pipeline should be on a continuous downward grade from the pond. Protect the dam from damage by trenching around the end opposite the emergency spillway. The trench may need to be 5 or more

feet deep at the highest point to facilitate gravity flow. Most contractors will begin at the shutoff valve adjacent to the waterer and trench toward the pond, stopping within a few feet of the water's edge.

Step 5: Install Barrier and Anti-Seep Collar

After the pipeline has been laid out, create a seal around the pipe and across the trench. Construct the barrier in line

with the pond dam within 20 feet of the water's edge. Use an anti-seep collar and/ or bentonite clay to form a barrier and prevent water from following along the pipe. When using bentonite clay, it is important that it extend across the trench to the edges where it is most difficult to compact the backfill. For the Ellis County installation, along with bentonite clay, a 2-foot-by-2-foot rubber membrane anti-seep collar surrounded the pipe.



To install the collar, use a pocket knife to cut a small hole in the center of the collar (rubber membrane) then push the pipe through the hole. Secure the collar to the pipe with a stainless steel hose clamp. Place pipe and collar into the trench so the collar extends across most of the trench. Make a relief in the bottom of the trench, preferably with a shovel, allowing the lower half of the membrane to extend from the pipe and rest on the trench floor. Install an accessible intake valve on the pipe to the pond side of the anti-seep barrier. Provide access to the surface with a covered tube. Use ball valves for the intake and shutoff valves because gate valves tend to deteriorate over time and lose their seal.

Seal around the collar, trench, and valve-protection tube by filling and compacting 8-inch layers of clay subsoil. Continue layering and compacting to the trench surface. The compacted backfill section should extend about 15 feet each direction from the membrane, or a total of 30 feet. The backfill is most effective when the soil is quite wet and thoroughly compacted by tamping.



This barrier will help prevent a washout along the pipeline.

Step 6: Assemble the Intake Line



The intake line has two parts: a section buried into the pond's edge and a floating section extending toward the deepest part of the pond. A flexible coupling (such as a radiator hose) must connect the sections for proper floatation.

A series of holes ¼ to ⅜ inch in diameter, or a protective screen or filter at the end of the floating pipe section allows inflow and keeps debris out of the pipeline. Attach a float device to the end of the intake pipe using chain to hold it 18 inches below the water's surface. The inlet should extend into the deepest part of the pond, which could be 40 feet or more from the bank. Connect the length of intake pipe to the pipe in the trench.

At this point, the pipeline is assembled. At the waterer, place the shutoff valve in its desired position first. Then lay the remainder of the pipe into the trench (including the anti-seep collar), working toward the pond. Connect the intake line and float device to the pipeline and lay it in the water. Most often, the valve is closed so the line will not yet fill with water.

Step 7: Extend Trench Into the Pond

Now that the anti-seep barrier and valves have been installed, the remainder of the trench can be finished. Trench the intake line into the pond. Remember the trench must get shallower as it goes toward the center of the pond. It is desirable to have a minimum trench depth of 4



feet at the pond's edge. Place the intake line into the trench. Open the valve at the lower end of the pipeline. The pipe should begin filling with water. As it fills, the pipe will sink to the bottom of the trench. Water will begin to flow when all air has been discharged. Allow the water flow to flush debris out of the line. Close the shutoff valve near the waterer.

Step 8: Set and Stabilize Waterer



Prepare the site for the tank by excavating the location for the waterer. Gravel, small rock, or sand make a good base to support the waterer. This base will be used to level the tank from front to back and left to right. Check the level several times. Be sure the waterer is

firmly and fully supported. An area with a radius of about 15 feet in front and to the sides of the waterer should be excavated for a hardened surface or pad where livestock will stand without being in mud. The front lip of the waterer should be about 15 inches above the area where the livestock will stand.

After excavating, lay a geo-textile fabric on the pad area in front of the waterer and cover with a 12-inch layer of course gravel or small rock (2-inch diameter maximum). It is recommended that a 6 inch trench be used to anchor the edges of the fabric to prevent it from snagging and shifting. Some producers may prefer a concrete pad, but the geo-textile fabric and rock are about one-third the cost. Positioning the waterer lip 15 inches above the top of the gravel pad is ideal but a minimum of 6 inches to a maximum of 20 inches is acceptable. If the tank is installed too deep, calves will step in it and dirty the water.

Step 9: Connect the Waterer

To remove debris and assure water flow, thoroughly flush the water line from the pond through the valves at the waterer. Then connect the pipeline to the waterer. A flexible connector



that will allow for some shifting is ideal to join the pipeline to the waterer. Connect a drain pipe to the waterer so it discharges on grade to a ditch or draw at least 50 feet from the waterer. In the example illustrated here, the drain pipe was about 50 feet long. Test

the valves, flow, tank float, and discharge pipe before covering any part of the waterer.

Install a retaining wall stabilizer that extends to both sides just behind the front edge of the waterer. This wall supports the soil that rests against it and may be concrete, railroad ties, road guard, or other material able to support a wall of soil three feet high. The Ellis County waterer was purchased with concrete stabilizer wings on each side to support the soil compacted around and over the tank.

Step 10: Protect the Waterer

When all parts of the system are working properly, fill and compact soil over and around the tank in a 15-foot radius to provide insulation and protection. Cover the back, top, and sides of the waterer with at least three feet of soil. Barricade or fence around the sides and back of the soil cover to keep livestock from standing on and damaging it.

New Pond Installation

Overview

For a new pond, trench the pipe under the dam 20 to 30 feet to the side of the deepest part. Slope the trench walls at a ratio no steeper than 2 feet horizontal to 1 foot vertical to get an area wide enough to allow for good compaction around the pipe. Use a rubber or a 30-40 mil plastic anti-seep collar clamped to the pipe to make a good seal. Dig the collar into a narrow trench perpendicular to the pipe and firmly tamp it into place in wet soil. This reduces the risk that it could leak and not successfully hold water.

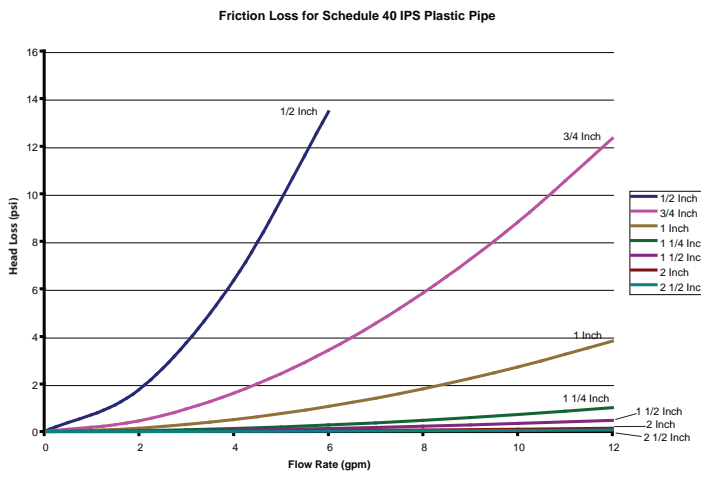
Compaction for a pond so it does not leak is best done when the soil is very wet. To test soil dampness, take a small clump of subsoil and work it; then roll it into a cord 1/8" in diameter. If it does not roll or falls apart, it may be too dry. Try adding more water to get it to form a cord.

Planning and Design for a New Remote Livestock Waterer

- Measure the distance from the pond intake to waterer. Follow the pipeline route.
- Use a surveying level to obtain elevation difference from the pond to the waterer. Assume the water surface at the trough will be about 12 inches above the ground.
- Know how much water is needed in gallons per day (gpd). Use the number of animals with access to the water times gpd for those specific animals. See Table 1.

- Use elevation drop divided by the length of the pipeline in 100s of feet to determine the maximum friction loss.
- Size the pipeline to supply the total water volume needed for 4 to 8 hours with the determined friction loss.

Chart 1. Friction Loss



Expected Installation Costs

Western Kansas \$2,000-\$2,500*

Eastern Kansas \$1,000-\$1,400*

* Does not include construction labor or fencing cost which is required for cost-share and water quality protection benefits.

Cost-Share Opportunities

Kansas State Conservation Commission: Develops a list of eligible cost-share practices prioritized by and available through local conservation districts. Cost-share rates for qualifying practices may be as high as 70 percent.

Environmental Quality Incentive Program (EQIP): This is a USDA Natural Resources Conservation Service (NRCS)-administered program that offers cost-share of up to 75 percent on certain conservation practices.

Kansas Alliance for Wetlands and Streams (KAWS): Offers cost-share for livestock water supply at a maximum of 70 percent. Applications are submitted through the local Conservation District Office.

Kansas Department of Wildlife and Parks (DWP): Through the Fishing Impoundments and Stream Habitats Program (FISH) the DWP leases private waters from landowners for public fishing. Participating landowners receive payments according to the number of water acres enrolled. Annual payments are \$40 per acre for impoundments. Water must be accessible to the public from March 1 to October 31.

Kansas Rural Center: The Clean Water Farms Project offers up to \$5,000 in cost share to farmers in certain high priority watersheds.

2004 KERP Team Members

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Project Cooperators

- Ellis County Conservation District
- Kansas Alliance for Wetlands & Streams
- Kansas Department of Health and Environment
- Kansas Environmental Leadership Project (KERP)
- Kansas Farm Bureau
- Kansas Grazing Land Water Quality Team
- Kansas Rural Center
- Kansas Water Plan
- Kansas Watershed Specialists
- Kirk & Colleen Dickinson Ranch
- K-State Research and Extension, Ellis and Russell counties.
- NRCS – Ellis County Office and EQIP Program
- Smoky Hill River Task Force
- State Conservation Commission
- Stewart Concrete

Online Resources

Kansas Department of Wildlife and Parks:
www.kdwp.state.ks.us

Kansas Environmental Leadership Project:
www.oznet.ksu.edu/kelp

Kansas Livestock Environmental Stewardship:
www.oznet.ksu.edu/kles

Kansas Rural Center: www.kansasruralcenter.org

KAWS: www.kaws.org

NRCS - Kansas: www.ks.nrcs.usda.gov/

State Conservation Commission:
www.accesskansas.org/ksc/

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Kansas State University Agricultural Experiment Station and Cooperative Extension Service

MF 2737

July 2006

K-State Research and Extension is an equal opportunity provider and employer. Issued in furtherance of Cooperative Extension Work, Acts of May 8 and June 30, 1914, as amended. Kansas State University, County Extension Councils, Extension Districts, and United States Department of Agriculture Cooperating, Fred A. Cholick, Director.