This article was presented on June 25th 1998,
& June 24th, 1999 at the Purdue Forage Days.

HOW TO DELIVER WATER TO THE PADDOCK

Del Hall, Grassland Conservationist
Jerry Lish, District Conservationist
Indiana Natural Resources Conservation Service

The first question is "How much water?". The second is "How do I get the water to the paddocks?". These questions of course depends on several factors; the kind and size of livestock, the condition of the forage, the climatic conditions, distance to water, the terrain, plus other factors.
The following table (taken from the University of Wisconsin “Pastures for Profit” publication) can be used as a general guideline for daily water requirements of grazing animals. These are estimated requirements for Wisconsin. Indiana requirements will be different and will depend if you are in northern or southern Indiana. Check with your local professional.

ANIMAL	GALLONS/DAY
Beef	8-10
Dairy (milking)	40
Sheep	1
Horses	8

Jim Gerrish at the Forage System Research Center, Linneus, Missouri has reported that for a beef cow-calf pair at 50 F, water consumption was about 6 gallons/day and at 95 F they would drink about 24 gallons/day. He also said that the closer to the water source the cattle remain, the more often they will visit and each visit would be of shorter duration. Cows with water available within 800 ft at all times, drank 15% more water daily than cows that traveled over 800 ft to water. Part of this increase in water consumption is based on the fact that the cow spends more time grazing and less time going back and forth to the water. A mature cow needs 3.5 – 5.5 lb. of water per lb of dry matter. Cows will typically drink water at a rate of about 2 gallons/minute and will drink for 1 to 3 minutes at a time. This information helps to determine how much water is needed at a paddock. If the distance to the water is 800 feet or less then the cows will go to drink when they are thirsty and the social aspect of drinking disappears as one or two cows will drink at a time and consumption is only a gulp or two.

Ralph Quillin of Paris, Kentucky learned that by following basic rules for livestock watering has allowed them to water over 100 cows (125,000 pounds in one group) with portable water tanks that are as small as 14 gallons (10 to 12 gallons

of actual water). One of the basic rules for Ralph is that the cattle should not have to walk over 500 feet to water. He also points out that pasture water 101 teaches that dry matter intake and water consumption is directly proportional. And of course, rate of gain and livestock performance is directly related to this intake.

SOURCES OF LIVESTOCK WATER

Ponds

The highest quality water in a pond is down about 1.5 to 2 feet from the surface. A floating inlet and piping system using gravity flow to a tank or series of tanks is the best system. If the pond is not high enough to use gravity then a pumping system of some kind can be used. The pond well is an excellent system to obtain quality water. The pond well is developed by digging a trench from the pond to a well site located 10 to 50 feet from the pond. This trench is as deep as the pond. The trench is partially filled with gravel out to the well site. The well site is developed by placing 24 to 36 inch tiles from the bottom of the trench, seated on the gravel, to above ground. The gravel is covered with geotextile material then the trench is back filled with soil. A pump can be placed in the new well that is fed by the pond. Livestock should be fenced out from most ponds. This decreases localized soil erosion, decreases disease problems, improves water quality, and improves animal performance. A Canadian study showed an increase in cattle performance (gain per day) when watered from a trough compared to a dugout pond. If livestock must be watered out of the pond, then a ramp that will limit access should be used. New ponds and pond sites should be designed and evaluated by someone with pond experience. A leaky pond is an unhappy pond.

Wells

This is an excellent source of livestock water. It usually is close to electricity where an electric pump and piping system can be used to supply the water to paddocks. Two important issues must be considered; first is the quantity of water adequate to handle the present uses plus the requirements of the livestock and second is the well sealed properly. If it is being used for the household it has probably been checked, but if the well is where pesticides are mixed or where runoff can enter, then problems can develop. If you are considering a new well, contact someone who has knowledge of the aquifer data in the area. In many cases this is the old timer who has been drilling wells is the area for the last 40 years.

Springs and seeps

If there is interest in a new or redeveloped spring contact someone with spring development experience. Springs can be a good source of water but it needs to be tested during the dry part of the season to determine volume. The spring should be protected. The water can be piped by gravity to one or a series of tanks. A pumping system can also be used to deliver spring water to the livestock.

Streams
Many producers are fencing livestock out of streams or restricting their access to the stream for drinking only. Limiting the animals to small areas that have been protected from erosion allow them a watering site without disturbing the entire stream bank. Some producers are restricting all access and pumping the water from the stream into tanks for the livestock. Research in Michigan has shown that given a choice, cattle drink from a spring-fed water trough 92 percent of the time and only 8 percent of the time from a stream. Their research also show that luring cattle away from a stream reduces fecal streptococci bacteria in water by 77 percent, nitrogen by 54 percent, phosphorus by 81 percent and total suspended solids by 90 percent. The pond well, discussed earlier, can also be used from a stream or river.

Rural Water
Rural water has many advantages; no pumps, steady supply, and quality water. The disadvantage is that rural water is not always available. Plus the cost can be very high, but in many cases the cost is not as high as one might think. The delivery system is cheap compared to many systems. In one study, the producer would water his stockers for 98 cents/head/month.

PUMPS

Electric pumps
There are several kind of pumps to choose from, shallow well jet pumps for wells to 25 feet, deep well jet pumps for wells to 80 feet, and deep well submersible pumps that have pumping depths of sever al hundred feet. The decision here is how deep is the well and what volume is needed. The pump size should be matched to the volume needed. Use a pressure tank in your system because it reduces the cycling of the pump, which in turn increases the pump's life. Contact your local electrician for information on size and quality of the pump.

Livestock powered pumping systems (nose pumps)
Nose pumps are simple and economical to operate. The animal supplies the power and they learn to do this very fast. Thus, they can be used in remote locations. They are portable so can be used in several locations. Nose pumps can lift water up to 18-20 feet and can pull water on level ground up to 300 feet. They can be used at ponds and streams to eliminate direct access. One nose pump can water 25-30 cows. Costs range from $350-$500 per pump.

Solar pumps
These pumps use a solar panel or panels, connected to a submersible or non-submersible pump. The solar panel can be attached to a tracking system that follows the sun, and or to a battery backup system that is charged by the solar system on sunny days to be used on cloudy days. Because these pumps are driven by sun power a larger tank could be used for reserve water on cloudy days. Some recommend a tank that holds a three-day supply or a battery backup

that can run the pump for three days. Cost is $1600 for a starter kit and up to $5000 for a deluxe system.

Hydraulic ram pumps
Ram pumps have been around for over 200 years. Ram pumps use the energy of falling water from spring, pond or creek to pump the water to a higher elevation, without the need for an external energy source. The fall from the water source must be at least 2-3 feet, and a minimum of 1 gallon per minute flow is required. Depending on the make and model of the ram, these pumps discharge from 70-90% of the source water and pump the remainder into a water storage or tank for use by the livestock. Cost -- $120 for a small ram to $2500 for a deluxe system.

Slingpump
The slingpump is like a windmill, but is placed in a stream and the stream flow turns or drives the pump. The slingpump has a propeller that is attached to a drum As this propeller and drum turn it picks up water that is then pumped to a tank. The faster the drum turns the faster it pumps the water. It needs to be placed in a stream with good flow. Cost -- $800 to $1800.

PIPELINES

We know we have the quantity of water needed and we know how much the livestock need. We have also chosen the pumping system. Now we have to get the water to the paddock in the right amount and at the right time. There are freeze or burst proof pipes that can be run on top of the ground. When laying out paddocks many graziers recommend running the pipe on top of the ground until you're sure how you want the paddocks. If livestock have to "travel" to water as in a continuous grazing systems, or in a paddock system with only one central source, then the tank size should be ¼ of total daily needs and refilling of tank should take 1 hour or less. If we have water in each paddock and the livestock do not have to "travel" more than 500 to 600 feet then some of the guidelines discussed earlier would apply. Pipeline size in order to supply the needed water is determined by the pressure pushing the water. Whether this pressure is by a pump or gravity really doesn't matter. The gravity pressure is determined by what is called head pressure. Each 2.3-feet drop in elevation will increase water pressure by l psi. Pumps are controlled by psi. Very simply the lower the pressure the larger the pipe size, the higher the pressure the smaller the pipe size. Your local NRCS, SWCD, and Extension offices have charts for determining the needed pipe size and pressure to deliver the right amount of water to the paddock.

TROUGHS AND TANKS

We have discussed matching the tank size to your grazing system and livestock. The location has been discussed; within at least 800 feet of the livestock if at all

possible. The material that the tank is made from isn't important as long as we know that the tank will do the job and last for a reasonable length of time. We need to know that the tank has not been contaminated with a toxic material or will not give out a toxic substance. Try to move the tank every day, if only a few feet, when you are in a multiple day paddock rotation. This will keep compaction and mud to a minimum around the water area. If the tank is in a permanent location then the site should be a well drained and properly prepared. Place stone or gravel around the tank underlain with a geotextile material. Make sure tanks are plumbed properly, with good shutoff valves. With continuous flow tanks, the overflow should be piped away from the tank to a good drain area. Protect the water from freezing by using heaters, in ground tanks, freeze proof tanks, or a thermostat controlled valve that allows a continuous flow in freezing weather. Moving water is very difficult to freeze.

ACCESS RAMPS

Access ramps allow limited access to ponds, streams and rivers while limiting free access to water bodies. Cattle are given access to only a portion of the water through a stabilized ramp to prevent erosion and direct deposit of urine and feces. Improved access to water has been shown to increase water intake and may help prevent leg injuries. Access ramps need to be constructed with relatively low slopes (6-8 feet of run for every foot of rise) with an alley width of 10 feet. The alley should not extend more than 2.5 feet into the pond, stream or river. Each ramp should serve at least 60 cows; again this is determined by how far the cattle most travel. If additional watering space is needed then construct additional ramps. The ramps could be side by side or down stream from each other. Construction is simple; a 1.5 - 2 foot thick run of gravel should be laid into a narrow bank and compacted. Geotextile fabric placed under the gravel will provide additional support and will reduce the amount of stone required.