



BEEF

Chapter 56

Pasture Water: Innovations

Pete Bauman

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gravity from a spring or seep in order to improve the overall quality of water provided to livestock and to decrease negative impacts to the resource.

Figure 3 demonstrates the overall improvements to the resource simply by eliminating the cattle from the water source. Elimination of livestock allows for improvement of overall water quality by eliminating feces, urine, and erosion of the banks. Improved livestock health and wildlife habitat are the results.

Where available, natural springs and artesian wells can be utilized for improved water delivery to livestock. Springs, seeps, and artesian flows can harbor unique and/or rare plants and animals, so development of these sites should be done in consultation with a professional who can assist the producer in minimizing impacts to the resource while accomplishing water delivery goals. Figure 4 shows an artesian well that was tapped for water delivery with an electric pump option.



Figure 4: Although uncommon, artesian springs do occur in South Dakota. In this case, the spring provides enough natural pressure to lift the water several feet above the surface of the ground through a shallow PVC pipe. Water is then gravity-fed through flexible black 1 ¼" PVC to a small pump house equipped with an electric pump and pressure tank. Livestock are excluded from access to the spring. *Photo by Pete Bauman.*

Solar powered water systems: As solar power technology improves and becomes more affordable, the options for improved water management in remote locations are increasing. With the awareness and desire to protect ponds, dams, and dugouts from contamination and erosion caused by livestock, many producers and conservation organizations are employing solar power in isolated pastures where electricity is unavailable. Solar powered water delivery systems are becoming very advanced, with many options and modifications for customization

now available. However, the basic premise of a solar system is to simply allow a solar panel to gather light energy from the sun, convert that energy into usable electricity that drives a pump, and pump the water to a storage tank for consumption by livestock (Figure 5).

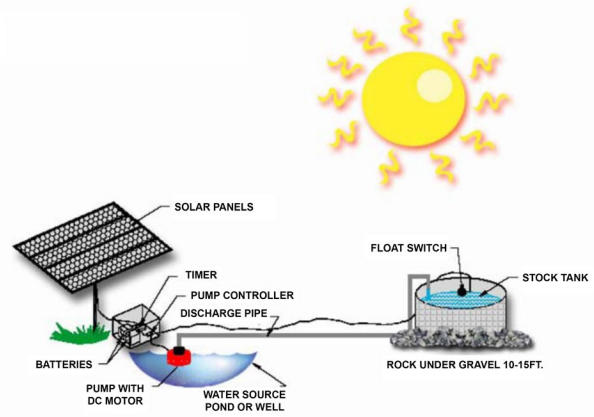


Figure 5: Basic layout of a solar water tank system. *Diagram taken from Blocksome and Powell, 2006.*

Although basic solar water delivery system designs are relatively constant, components continue to advance the ease of use for producers. Improvements in solar cell technology have resulted in reliable, efficient, and durable solar panels capable of producing adequate power and yielding sufficient water flow, rendering solar systems as a trusted option for remote livestock watering.

Solar pumps: Historically, most solar water systems relied on traditional cylindrical well casing pumps (Figure 6) suspended from some type of float system to pump water from a pond. A casing pump is roughly 36 inches long when suspended vertically from a float mechanism, and the pumps require about 48 inches of water to ensure adequate pump



Figure 6: Example of casing pump (left) and float pump (right). *Photos by Pete Bauman.*

clearance from the bottom of the pond. In some instances, pumps can be installed horizontally to allow for use in shallower waters (even creeks). Because they are relatively long, casing pumps generally draw from deeper areas of the pond, which can be beneficial as the water provided may be cooler and cleaner (Figure 7).

Aside from the traditional casing pump, perhaps the most user friendly improvement has been the development of floating pumps (Figure 6). These compact units float on top of the water and draw from the upper portions of the water body (Figure 7). Because they draw from the top of the water column, these pumps tend to deliver warmer water that may contain algae in late summer. However, this water is still markedly cleaner and of much better quality when compared to water sources where cattle are allowed to mire in the pond, dam, or dugout. Manufactures often rate their panel and pump combinations in gallons per minute and/or number

of head (livestock). Generally, casing pumps with larger solar panels tend to deliver a greater volume of water than do float pumps. Most suppliers will assess needs and make recommendations on the appropriate panel and pump setup.

Solar Panels: Solar panel management is perhaps the most challenging part of designing a permanent or portable system.

While most manufacturers recommend mounting larger panels on permanent posts for stationary systems, producers have designed options for portability, convenience, and weather resistance (Figure 8).

As solar panel efficiency improves and the desire for more options for compact systems and portable systems increases, some manufacturers have begun building systems that are simple and efficient to service and transport (Figure 9).



Figure 7: Example of a typical float pump installed in a dugout where cattle are excluded (top). Photo on the bottom shows a float pump (blue pump) compared to a casing pump connected to a floating tire and rim. In shallow water sources, vertical casing pumps can contact the bottom if not installed properly. *Photos by Pete Bauman.*

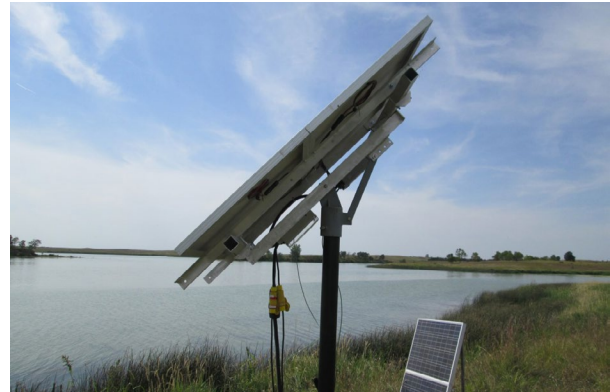


Figure 8: Photo on the top shows a permanently mounted panel system wired to a submerged casing pump. Photo on the bottom illustrates producer innovation, mounting a large panel on a homemade trailer allowing the panel to be used in several locations throughout the pasture. *Photos by Pete Bauman.*

Wells: Wells can still be a viable option for water delivery to livestock where available. Well use and management is regulated under various groundwater regulations, and producers should review rules specific to their situation prior to installing or utilizing wells for livestock. The information contained here assumes that the user has determined that the use of the well for these purposes is permitted. See <http://denr.sd.gov/des/wr/summary.aspx> for information on well use in South Dakota. Figures 10 and 11 demonstrate a variety of innovative well options producers may consider if refurbishing or installing new wells.

Nose pumps: Nose pumps refer to pump systems that are operated by the action of the animal actively pushing a plunger or piston with their nose, commonly activating a diaphragm system to lift water to a trough. These systems deliver roughly ½ to 1 pint of water per stroke. Although they have been in use for many years, nose pumps are not traditionally a popular option in South Dakota. The Vermont Natural Resources Conservation Service lists the following information as pros/cons for traditional diaphragm nose pumps:

- Nose pump advantages:
 - easily moved, set up, and maintained
 - no energy source is needed
 - can be used to access sources of surface water
 - can be set back from the water source, reducing contamination concerns



Figure 9: Photo at left shows a compact solar panel and weather resistant component system (black box) permanently mounted on a small utility trailer. The box houses a backup battery, electrical system, and supplies. Trailer space allows for transportation of tank, pump, and hose. The system at right is a commercial system with a similar solar panel and weather resistant component box mounted above a steel water tank. This system utilized a tank transport skid that is easily removed. In both cases, managers are afforded convenience and flexibility when moving livestock between pastures and water sources. *Photos by Pete Bauman*



Figure 10: Isolated or abandoned pasture wells or old windmill pits can be refurbished for use under certain conditions, either with solar powered or 110V pump systems. Solar systems on wells where significant lift (>15 ft.) is necessary may require higher capacity solar panels and casing pumps to generate enough electricity to deliver adequate water volume for livestock (*photos by Pete Bauman*).

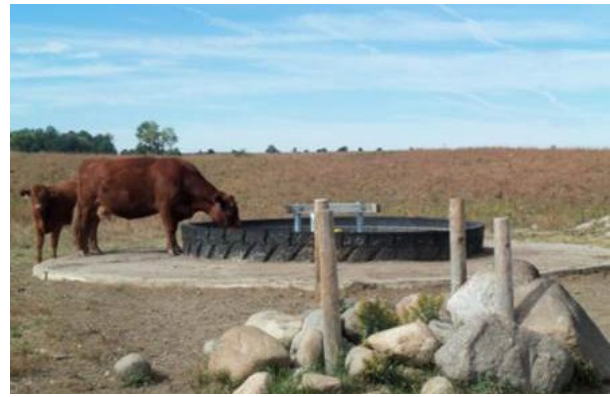


Figure 14: Where available, some producers opt for installation of water hydrants when installing rural water (left). Installation of durable rubber tire tanks and concrete pads ensure longevity in remote pasture situations (right). *Photos by Pete Bauman.*

and modify both permanent and temporary/movable water systems quickly and efficiently. Improvements to the pipe and components have resulted in durable systems that are not damaged by livestock, can be driven over with vehicles, are able to be pulled, and can even be allowed to freeze (although not recommended). Components allow for quick attach/detach operations, quick coupling to tanks, drainage ports, and pressure monitoring where necessary (Figure 15).

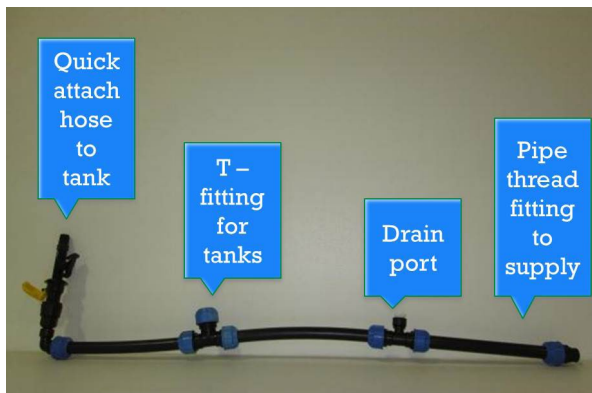


Figure 15: (Below) Typical components of PVC pipe system (photo by Pete Bauman). (Below Left) Options include quick attach for garden hose to tanks, pressure valves, T's, elbows, and end plug. *Photos by Rick Smith.*

Statistics on 1" diameter 160 psi HDPE pipe:*

- Piping distance depends on topography and available pressure. One mile is a practical limit, but some systems have gone much further.
- Delivery distance depends on the source. Generally, rural water will provide the longest delivery pressure, with 220V or 110V electrical systems providing adequate water pressure in many cases. Solar power or other systems may be limited, depending on the rise and run of system.
- In some cases rural water systems have the ability to raise water pressure at the delivery point.
- With 160 psi pipe and 200 psi compression fittings, achieving a delivery pressure of 80 psi or more is feasible.
- Bigger tanks can compensate for low water flow because they offer more storage capacity.
- Rocky ground is ideal for above ground pipe choice.
- With hills or rolling ground, it is easy to place drain plugs and drain the system when desired.
- Overland pipe offers exceptional flexibility.
- Zero disturbance to land and resources when laid on top of ground.
- Exposed black pipe can heat up quickly, but vegetation soon covers the pipe, keeping water relatively cool.



Figure 16: Map of a Grant County, SD ranch that utilizes an array of methods for fence and water development under assistance of the NRCS EQIP program (top). Black lines on map are permanent 4-strand barbed wire perimeter fences. Yellow lines are single-strand, semi-permanent high tensile cross fences. Water is provided via natural ponds, dams, and dugouts. Blue symbols represent watering stations where livestock access to the water source has been restricted via temporary electric fence, and water is supplied via manufactured solar float pumps and delivered to manufactured movable solar tanks (bottom). Cattle are fenced out of all dams and dugouts with a single strand of smooth electric wire. *Map and Photos by Mike McKernan.*

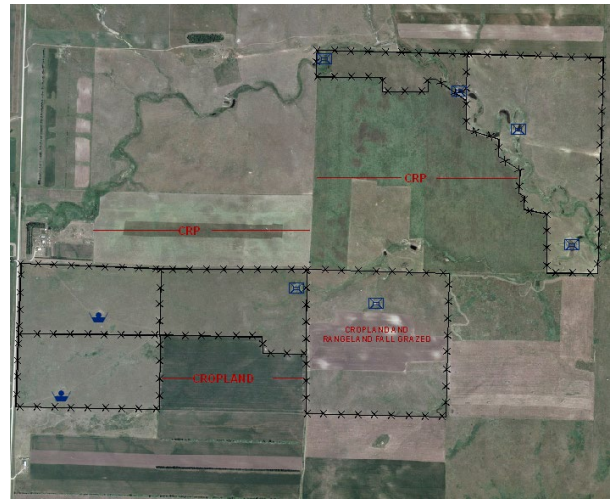


Figure 17: 'Before' map of a ND ranch utilizing expired Conservation Reserve Program (CRP) fields. Permanent fences (black lines) are placed as typical rectangular pastures with water sources located within large paddocks. *Map courtesy of Burleigh County ND Soil Conservation District.*

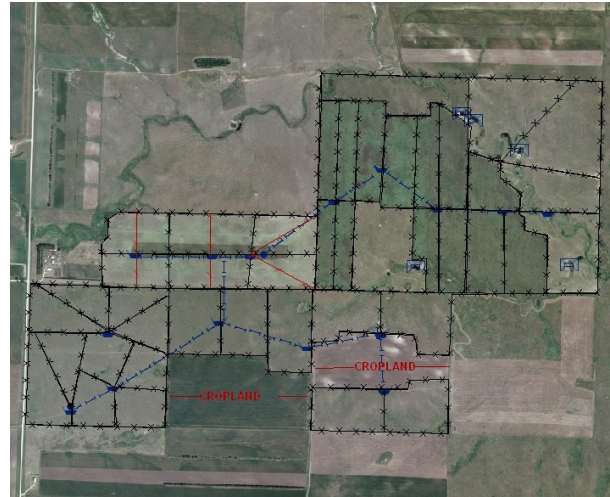


Figure 18: 'After' map of the ranch shown in Figure 17 (left). Larger CRP pastures were subdivided into smaller paddocks with permanent fencing and water sources designed to service several paddocks. The producer stated that permanent fences are not ideal and would prefer temporary fences in most areas. *Map courtesy of Burleigh County ND Soil Conservation District.*



Figure 19: 'Before' map of a ND ranch. Permanent fences (black lines) are arranged in typical rectangular paddock design. Map courtesy of Burleigh County ND Soil Conservation District.

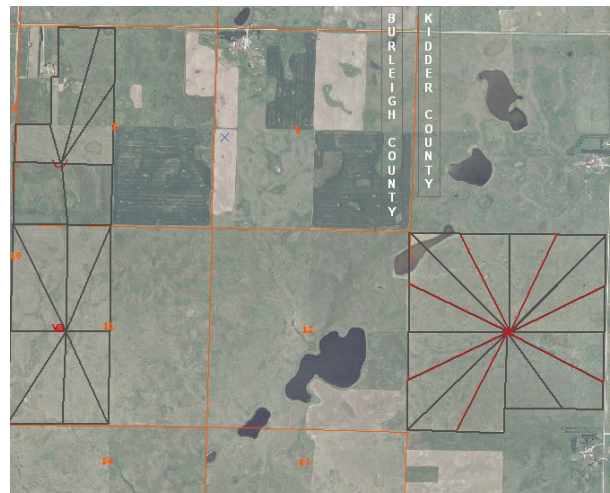


Figure 20: 'After' map of ranch shown in Figure 19 (left). Larger pastures are subdivided into smaller paddocks with temporary fencing and centralized water sources. Map courtesy of Burleigh County ND Soil Conservation District.



Figure 21: Map of a Deuel County, SD ranch fence and water plan resulting from an NRCS EQIP contract. Fences are permanent 4-strand barbed wire. The water system consists of underground rural water lines piped to permanent tire tanks set in concrete (upper right). Pipe trench scars are prevalent for several years after installation and may require special consideration for invasive species management (lower right). Map courtesy of Deuel County, SD Natural Resources Conservation Service, photos by Pete Bauman.



Figure 22: Producers interested in using livestock to manage remote or 'new' grazing areas where infrastructure may be limiting can utilize temporary fencing. In the photo at left, managers arrange a stock tank and moveable poly wire in a fashion that allows simply raising the wire to allow cattle to access the other side. At left, simple expanded steel escape ladders allow an opportunity for birds and small mammals to exit the water should they fall in the tank. Photos by Rick Smith.

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