

# Protecting Your Pond

## Tips to manage this important resource.

by **Linda Robbins**, assistant editor

**D**o you have a pond on your farm or ranch? Are you thinking of building one? There are a variety of reasons to have one or more farm ponds. Ponds can provide aesthetic appeal, wildlife habitat, educational opportunities, livestock watering, recreational opportunities, soil conservation, fish production and fire protection, just to name a few. Many of these uses can be managed simultaneously, such as livestock watering, fishing and waterfowl attraction, though Marley Beem, Oklahoma State University (OSU) extension aquaculture specialist, and Herschel George, Kansas State University (K-State) watershed specialist, say the primary reason most farm ponds exist in their areas is to water livestock, and typically cattle.

Mike Porter, senior wildlife and fisheries consultant for The Samuel Roberts Noble Foundation in Ardmore, Okla., says the first step in planning for a new pond or managing an existing one is to clearly define goals for the pond.

“When you have multiple goals, you make some compromises. You can definitely have a fishery in a livestock pond, and you can definitely have waterfowl hunting or attract waterfowl in a livestock pond,” he says. “However, each goal requires somewhat different pond design and management for optimum results. Whether a pond adequately serves multiple uses depends on how we design and manage the pond.”

### New ponds

Both Beem and Porter suggest landowners contact the Natural Resources Conservation Service (NRCS) for help in assessing a potential site and designing a pond and dam properly.

“The NRCS will help evaluate the soils as far as water-holding capacity, and they can help determine if you have a large enough watershed size (the area of drainage flowing into the pond) to support a potential pond on a given site,” Beem says. “They are probably going to give you some recommendations that are not what your neighbors are doing. They will probably recommend a wider top and gentler slopes on the dam, which is going to require more cubic yards of soil to

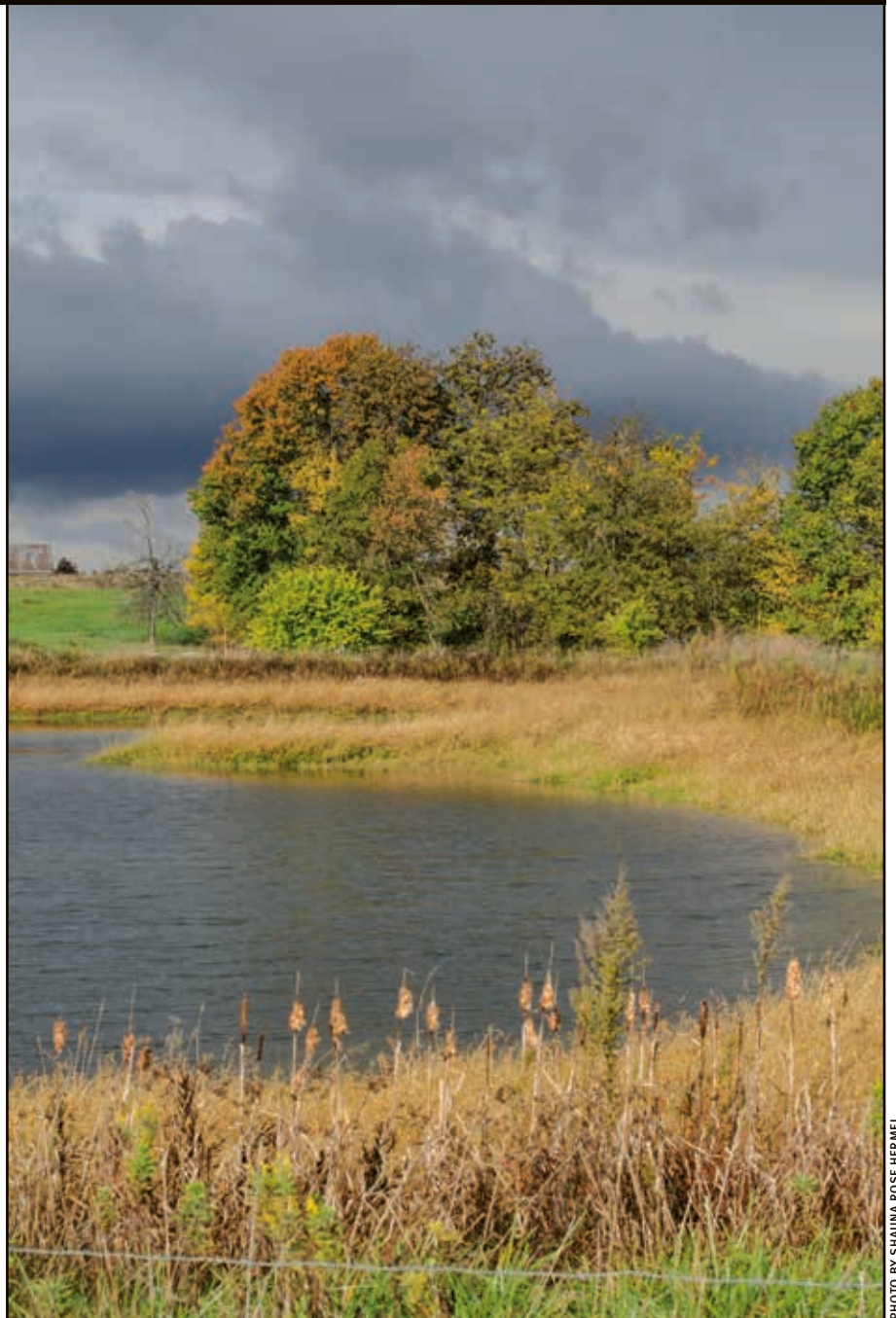


PHOTO BY SHAUNA ROSE HERMEL

► Ponds can provide aesthetic appeal, wildlife habitat, educational opportunities, livestock watering, recreational opportunities, soil conservation, fish production and fire protection, but they need maintenance.

be moved, and it will make it more expensive, but you're going to end up with a dam that will have a much longer life.”

The acre-feet or volume of water in an embankment or watershed pond needs to match the size of the watershed, Porter adds. “If a landowner's primary goal is livestock watering, a pond needs to have adequate depth to be permanent water. There's not a single number that I can provide for

optimum depth and size, because it varies depending on the rainfall, slope of the land, vegetative cover and soil type in each area.”

He says the NRCS has a free, online publication, *Ponds: Planning, Design, Construction* ([www.dec.ny.gov/docs/fish\\_marine\\_pdf/pdconstruction.pdf](http://www.dec.ny.gov/docs/fish_marine_pdf/pdconstruction.pdf)), which has maps indicating the minimum depth and optimum watershed size per acre-foot

CONTINUED ON PAGE 248

of volume necessary to prevent a pond from drying up during drought.

“Commonly, people want to build a pond too large or too small of a watershed,” Porter adds. “People also need to realize when you build an earthen pond, it starts to silt in from the day that it is built.”

Because of the silting effect, Porter recommends building in more depth than you think you’ll need 20, 30 or 40 years from now. Though he doesn’t have good data for the rest of the country, Porter says most ponds in his area of Oklahoma, even on good watersheds, silt in about 0.03-0.23 feet (ft.) per year, so in 20 years, a pond will be 0.6-4.6 ft. shallower than the day it was built.

“Every pond, in geological time, is destined to fill in,” Porter says. “You need to build a pond deeper than you think you need, if the soils allow it.”

The biggest mistake Porter says he sees landowners make when putting in a new pond is not adequately studying the soils at the site where they want to build the pond.

“If you build a pond over sand, gravel or fractured rock, it usually will not hold water,” he says. “Sometimes the topsoil may be suitable, but when you dig down 8 or 10 feet, you may intersect another strata that’s not; and if you do, you have to seal it. People need to consider the soil, watershed, pond volume and depth — those are all important issues for a livestock pond. Those four things determine whether you have a suitable pond or don’t have a suitable pond.”

Porter adds that those four items factor into any goal for a pond, and modifications can be made to them and other aspects of a pond to optimize a pond for each goal. He suggests studying NRCS soil surveys in your area and talking to NRCS personnel who have generally been involved in the planning and building of dozens or even hundreds of the ponds in your county.

Beem says digging a few test holes can be helpful in assessing soil suitability, whether building a new pond or deciding to deepen an existing one. He says every pond is unique, and the NRCS can provide help if time permits in assessing individual situations.

### **Pond access**

Some landowners will install a stock

waterline through the dam with a trough or freeze-proof trough behind the dam at construction time. George recommends that owners then fence the pond so cattle don’t have access to the pond itself. The greater the number of livestock a producer has to water, the more necessary the exclusion fence will be. If the pond has an adequate elevation drop behind it for an effective tank, he recommends

putting in a trough.

In what he calls pit ponds, where there is not much fall below the pond, he recommends putting an access area into a part of the pond. George recommends producers put in a limited-access ramp that he compares to a boat ramp, designed for the maximum head of cattle to drink from the area. In a flier titled *Construction of a Limited Access Ramp in a Pond for Cattle Watering*,

George and Pat Murphy, K-State Biological and Agricultural Engineering Department, recommend the width of the water frontage area be at least 10 ft. wide plus one additional foot for each 10 head of cattle in the herd; so an access area for 80 head would need to be a minimum of 18 ft. wide.

In the flier, George and Murphy recommend two different construction

methods for surface hardening of the pond access area. The ramp section utilizes a gravel-filled open-bowl tire system on top of a geotextile fabric. The upper approach area utilizes a 6-inch (in.) layer of gravel on top of geotextile fabric.

The flier explains the open-bowl tire system, how to calculate the width of the access ramp, how to and how much soil should be removed from the ramp area, how to place the geotextile fabric and how to cover the tires, how to calculate the width of the gathering and approach area, how to construct the exclusion fence around the pond, and the use of a floating electric fence across the access area in the pond.

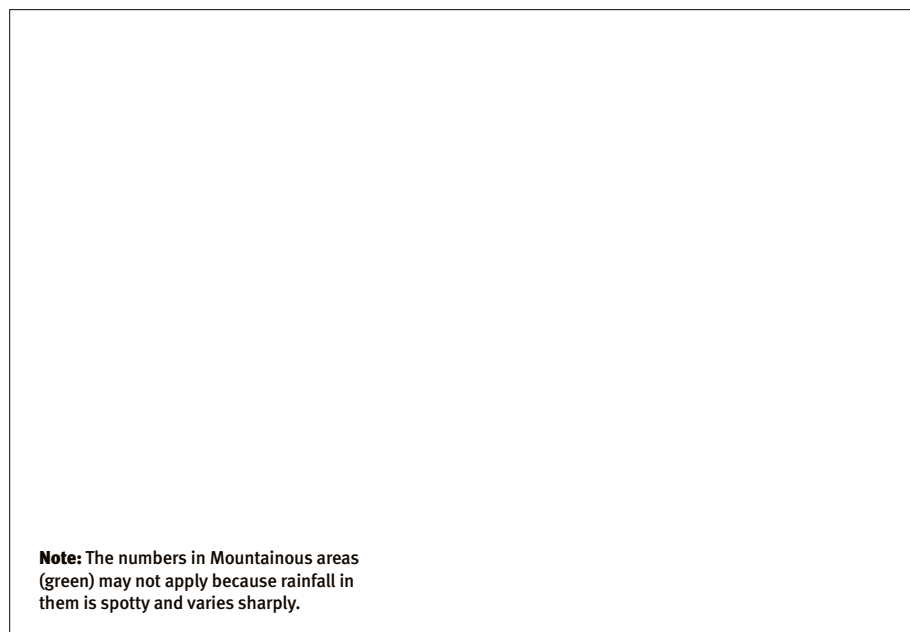
Porter says these areas are designed with rock and gravel so cattle are a little uncomfortable in the rocky area and won’t spend their day in the pond. He says they get their drink and then do their business out in the pasture, putting the nutrients onto the soil where producers want them.

Beem says he thinks some producers are resistant to putting in troughs or fencing because of the extra expense and management. In addition to the cost of the waterline through the dam, the trough and the fence, Beem says owners have to decide what they will be happy with in terms of vegetation inside the fence.

“Are you going to be happy with shrubs and everything growing in there, or are you going to have gates in the fence where you

**“Every pond, in geological time, is destined to fill in. You need to build a pond deeper than you think you need, if the soils allow it.”**  
— Mike Porter

**Fig. 2: A guide for estimating the approximate size of a drainage area (in acres) required for each acre-foot of storage in an embankment or excavated pond**



**Source:** NRCS publication: *Ponds: Planning, Design, Construction*.

will periodically turn cattle in for some flash-grazing or get in there with a brush hog and clean it out yourself?” he asks. “Either way, there are pluses and minuses.”

Porter says whether the fencing is justified depends on the potential impact the cattle will have on the pond and the cost of the fencing and water point. If a small number of cattle have access to a large pond, he says, he usually cannot justify the expense and extra time of building a fence and water point. If an owner has a relatively small pond with a large number of livestock having access to it, and the owner wants to maintain the livestock water resource for an extended time, the cost and time might be justified.

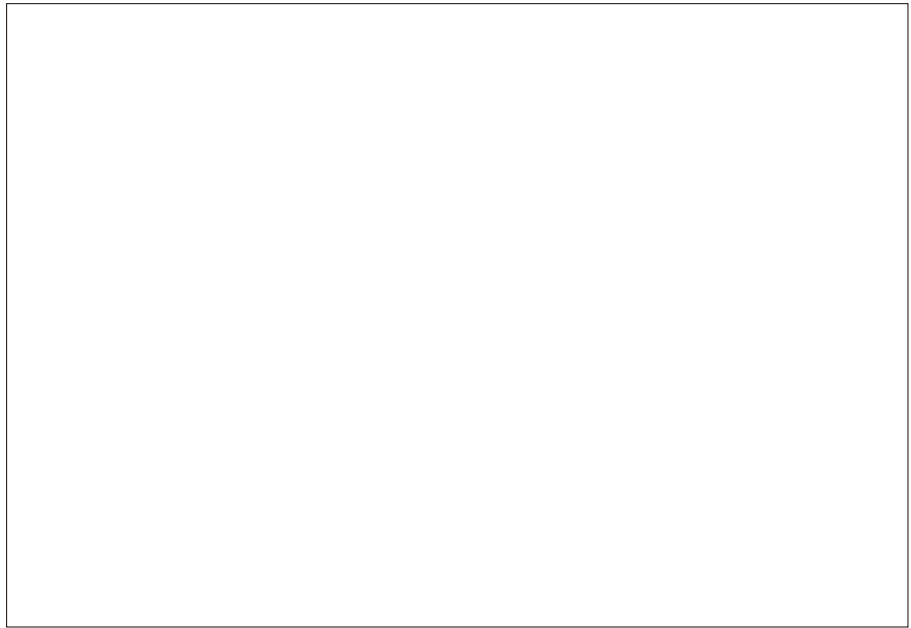
“It depends on how many livestock are using the impoundment and how frequently,” he adds. “If you have a pretty large pond with a small- to moderate-size herd of cattle that uses it for a couple of weeks per year, I’m not sure I can justify fencing the pond, considering cost or wildlife and fishery benefits. Such a situation might occur in some rotational grazing systems.”

Beem agrees the decision to fence depends on the potential for damage from cattle traffic in and around the pond.

“Cattle producers need to be aware that the pounds per square inch of hoof is quite high,” he says. “It’s higher than that of a bulldozer track per square inch, and the soils are soft and vulnerable around pond edges, so if there is heavy traffic in and out, that will lead to a shallowing out of the pond, which shortens the life of the pond.”

In addition to damage to the pond edges, Beem, Porter and George say the quality of

**Fig. 1: Typical embankment and reservoir**



**Source:** NCRS publication: *Ponds: Planning, Design, Construction*.

the water in the pond is adversely affected when cattle spend the day in the pond, depositing urine and feces into the water.

Porter says too many cattle with unrestricted access to a pond can also increase the siltation rate and cause the water to be muddy.

George warns that cattle can cause damage to the dam. In the heat of the summer they will not just stand in the pond, they will stand on top of the dam to try to catch even a little breeze. They can wear the top of the dam down, which also shortens the life of the pond.

**Existing ponds**

When it comes to existing ponds, Beem says the biggest mistake he sees pond owners make is not managing the pond. He says it’s like a lot of natural-resource issues — pond owners assume that something is just there and doesn’t require management. While there are different recommendations depending on where in the country the pond is located, he suggests walking the pond faces several times per year, checking for burrowing animals, and getting rid of them at the first sign. He also says you should remove young trees and shrubs from the dam on a yearly basis.

Porter recommends not letting trees grow on the dam because trees are living organisms and, at some time, they are going to die. When they do, the roots decay and provide channels for water to migrate through the dam, weakening it. Trees can also be blown over in storms and take big hunks of the dam with them.

“I like trees. They’re wonderful plants, and I enjoy having them around the rest of the pond, but not on the dam,” Porter says. “We try to maintain a dam so it is dominated by herbaceous vegetation.”

George says the one most important thing he suggests for managing an existing pond is to put a stock waterline through the dam, hopefully at construction time, though he did have several projects this summer to add lines to existing ponds.

“We can do that, though it’s not a fun process,” he says. “With our traditional farm ponds around here, we can put one in, in about half a day. Oftentimes, it’s nice to do that as you are going into a drought or when

**Fig. 3: Recommended minimum depth of water for ponds in the United States**

Wet	5 foot pond depth
Humid	6–7 foot pond depth
Moist subhumid	7–8 foot pond depth
Dry Subhumid	8–10 foot pond depth
Semiarid	10–12 foot pond depth
Arid	12–14 foot pond depth

**Source:** NCRS publication: *Ponds: Planning, Design, Construction*.

CONTINUED ON PAGE 250

the water is low because that lets you get the lines deeper into the pond dam and further out into the pond.”

Beem says there are some studies that suggest cattle prefer water from a trough rather than water directly from a pond, partly because it’s warmer in the winter.

George adds that while studies indicate cattle do gain better on water from a trough, he does not consider the increased gain the most important consideration when deciding to add a waterer (or limited access) and fencing the pond. He thinks the greater value is the protection and extended life of the pond.

“If you truly believe that ‘water’ is a resource that should be protected, then extending the life of the pond should be the basis for our decisions,” he says. “When the livestock waterline is installed in the pond at the time of construction, it may add an additional \$500 to \$1,000 to the cost of construction. The installation of a waterer may add \$1,000-\$1,500, and the exclusion fence could add \$2,000 or more depending on the size. Once you’ve done that, you have extended the life of that pond significantly.”

### Watershed and water quality

In addition to site selection and watershed size determining the quantity of water in the pond, Beem, Porter and George emphasize that the quality of the water is also determined by what is located in the

watershed. Beem says producers need to be aware that they can create problems for the pond if they locate corrals or stockpiled manure anywhere inside the watershed, because it’s going to contribute excess nutrients to the pond, and that is not a good thing for the quality of the water.

Porter says the watershed should be well-vegetated with grass or timber, and producers should usually avoid siting a pond where it will have annually tilled cropland in the watershed.

“If you have a pond with tilled cropland in its watershed, you want a vegetative buffer of 100 or 200 yards around the pond to create a biofilter to catch silt and settle it out there rather than in the pond,” he says.

George adds that livestock producers should think about where their livestock feeding operation is, where they haul hay to cattle in relation to the drainage area or watershed of the pond.

“I have seen a number of producers who will feed near ponds and within the drainage area of their own pond when they could have just as easily moved 50 or 100 yards and had it drain over more grass before it leaves their place and not into their own livestock water ponds,” George says.

Porter says two things dictate the quality of water in a pond: the watershed and the aquatic plant community. He says there is some indication that steers gain better with good-quality water, but he thinks it is a subtle difference. He says livestock are pretty tolerant of a relatively wide range of water-quality parameters, but you don’t want to create situations that will create poor water quality or even toxic water.

Though it’s not the norm, Porter says, when you have excessive nutrients and warm water, you might end up with a cyanobacteria bloom (commonly known as blue-green algae), and that may make a difference whether cattle should drink from a pond because it might be toxic. Beem and George also emphasize that having blue-green algae in a pond is a fairly rare occurrence, but George has seen cases of it, particularly during the 2012 drought.

“When I step back and take a look at the big picture, when I talk to the disease and diagnostic vet, the one who is in charge of that kind of testing, she agrees that the palatability issue is probably more economically important than the algae issue,” Beem says. “We have a lot less gain when ponds are getting lower and have flavor issues. If you keep the nutrient level down, and have a good phytoplankton bloom and the fish are there, you are much less likely to have toxic algae.”

### Innovations and recommendations

George has authored or coauthored several articles available online through K-State Research and Extension with instructions for constructing a pond access ramp using geotextile fabric and tires, adding tire tank waterers or a covered concrete waterer to existing ponds. He has also been instrumental in the use of solar-powered pumps to help livestock producers get water to pastures or paddocks so they can implement rotational grazing systems.

Beem says that in terms of technology, he likes the geotextile fabrics, though he thinks they have been more widely adopted in Oklahoma in construction projects and by the oil field industry. He says the geotextiles may not be in many farm stores, but the material is around and livestock producers should be aware of geotextiles and their use in preventing erosion.

His recommendation would be for producers to educate themselves about ponds with facts through a local extension office or state wildlife service. He says more educational materials and knowledge about ponds is available than producers would ever think about. He recommends pond



PHOTOS BY HERSHEL GEORGE

► **Above:** Construction of a pond access ramp using geotextile fabric and tires near Garnett, Kan.



► **Right:** A finished pond access ramp in use near Eureka, Kan.

owners be more aware and learn how the whole system works so they can recognize early some of the things that go wrong, so they can stop them when they are easier to fix.

“Be aware that the physical structures — the dam, the shoreline, the emergency spillway — can slowly degrade over time,” Beem says. “Be watching for any erosion on those, and don’t wait to call the NRCS for advice.”

“Don’t be the guy who calls the extension office and says, ‘There is water spurting out of a gopher hole in my dam, what can I do?’” he adds. “That’s going to be pretty tough to figure out how to fix.”



► K-State Research and Extension offers a video to explain how to test your pond for the presence of blue-green algae. To view via the digital edition, click the photo above. You can also navigate to [www.youtube.com/watch?v=ZRNWzFwKKJE](http://www.youtube.com/watch?v=ZRNWzFwKKJE) online.

## Rotational grazing and solar pumps

Herschel George, Kansas State University (K-State) watershed specialist, says a number of producers in his area have been adopting rotational grazing systems, and they are consulting with K-State Extension personnel for help to install solar-powered pumps to push water to the paddocks located above the pond.

George says many people use solar pumps for summer grazing programs, so there are no worries about winterizing the lines and pressure tanks. In the summer, more sun is available, so solar pump systems are going to work better. He encourages installing a reservoir or tank because the solar pump only works half the day.

“They don’t work at night, and you want to have enough water available for your rotational grazing system to work,” he says. “You don’t want the water system dictating your rotational grazing system, you want the availability of grass to dictate it.”

George says they have typically used diaphragm-type pumps, but lately have been using a lot of centrifugal solar pump systems that intake the water through a line while the pump itself is actually on the bank. He says it is much easier to use a pump you don’t have to submerge.

In 2006, George assisted Matt Caldwell, Parker, Kan., when he decided to go to a rotational grazing system. Caldwell, a regional manager for the American Angus Association, wanted to divide some pastures and needed to figure out how to get water to them. He originally contacted George for help to try using a gravity-flow system. When that was ruled out, Caldwell says George came up with the solar-pump idea.

George recommended a storage tank for the solar-pump system instead of a battery system as a backup for cloudy days or nighttime water needs.

“I decided to store water instead of electricity,” Caldwell says. “It requires less maintenance.”

Caldwell says after his solar system was installed, he and George put a second set of solar panels on a boat trailer frame. The portable unit can be used at multiple ponds in remote locations. An intake line is the only thing needed to access water from each pond.



PHOTO BY HERSCHEL GEORGE



PHOTO BY MATT CALDWELL