'You Get a Line, I'll Get a Pole ...'

The humble crawdad can teach valuable lessons to designers about surge volume in onsite system drainfield trenches

By Theo B. Terry, III, RS

Did you ever get a song stuck in your head? Most of the time, it's not even a song you like, and it can just about drive you crazy until you get it out.

Not long ago, I started humming "The Crawdad Song" — Andy and Opie sang it in an episode of "The Andy Griffith Show." You probably know it:

You get a line and I'll get a pole, Hon-ey,
You get a line and I'll get a pole, Ba-be,
You get a line and I'll get a pole,
We'll go down to the crawdad hole,
Hon-ey, Ba-by, mine!

There, now it's stuck in your head, too! Misery loves company, doesn't it? Stick with me, though. This song popped into my head for a reason, and by reading the rest of the story, we'll see if we can get this song out of our heads together.

I've been giving presentations at state onsite conferences about a drainfield sizing methodology developed by Dr. Kevin White at the University of South Alabama. Most regulatory agencies only consider hydraulic loading as important to drainfield sizing, but White's methodology takes into account organic loading as well.

His method also addresses the need for gas transfer (oxygen) and uses surge volume as a sizing check. (For more information about the full sizing method, refer to an article titled "Sim Drainfield" published in the December 2005 issue of this magazine.)

What crawdads know

Back to "The Crawdad Song." Speaking at the Kentucky Onsite Wastewater Association (KOWA) Conference in Lexington, I used an analogy to explain the need, or the lack thereof, for excessive storage volume in a drainfield trench. I asked the audience, mostly county regulators, if they had ever done a soil evaluation on crawfishy ground.

"What happens," I asked, "to the hole you just created with your soil auger during periods of high perched water events?"

Several quickly called out, "The hole fills up with water!"

Exactly! Even the crawdad knows that if he digs a tunnel to an underground chamber, it will eventually fill up with water and make him a nice home. So, too, any void we create within a drainfield trench will fill with water during periods of high saturation, and thus negate any storage volume that existed under dry conditions.

Above, a soil boring taken under saturated conditions. At right, a crawdad castle.

Even the crawdad knows that if he digs a tunnel to an underground chamber, it will eventually fill up with water and make him a nice home. So, too, any void we create within a drainfield trench will fill with water during periods of high saturation, and thus negate any storage volume that existed under dry conditions.

The crawdad also knows that in creating this chamber deep in the ground to fill with water when the ground is saturated, his home will stay moist longer, even as the soil dries out, because of the water previously stored in his living room. If the crawdad can figure this out, why haven't we as onsite professionals?

An experiment

As I sat in my living room not long after the conference, my son Theo asked if I had any ideas for a mandatory school science fair project. He thought I'd lost my mind when I jumped up and started singing, "You get a line and I'll get a pole, Hon-ey!"

I suggested: "Why don't we see if the crawdad is as smart as he appears to be when it comes to water storage in the ground, and relate our findings to onsite drainfields?" My son, the avid bass fisherman, is pretty impressed with crawdads, so once he got past my singing, he thought this project might be OK.

Naturally, this project had to have experiments. To begin, Theo installed three types of scaled-down drain trenches in an old aquarium, where they would be visible through the glass. One had open architecture, one had a synthetic aggregate, and one was made with gravel. Theo backfilled the aquarium with sand to mimic the soil surrounding a drainfield trench. He

then created a rain event by adding water to the surface of the sand until it was saturated.

Guess what happened. Exactly! The water migrated from the sand into all three trenches. Points to the crawdad: if you open up a void in saturated soils, the void will fill with water. But what about the crawdad's lesson as it relates to a moister home, even in drier conditions?

Taking it outside

Now it was time to test Theo's findings on the second part of the science project. Do the lessons learned from the crawdad hold true for septic drainfield trenches? To determine this, Theo used a coffee can (his trench) in which he had drilled numerous holes into the sides and bottom to act as the infiltrative surface.

He then placed this coffee can (trench) into a saturated environment (container of water) to a level about half its height. The can (trench) filled with water, just as in his first trial, when water flowed from the sand into the void of the scaled-down trenches.

Then, he removed the coffee can from the saturated environment and timed how long it took to drain, using a watch to determine how many seconds before there were no more drips. He used three types of coffee cans: one empty, one filled with synthetic aggregate, and one filled with gravel. He performed five repetitions for each trench.

And you know what he found? The empty can had the longest drain time. The can filled with gravel drained the quickest, followed closely by the can filled with the synthetic aggregate.

Applying these findings to drainfield terms, the trench with the greatest storage volume (open architecture) recovered the slowest, and the trench with the least storage volume (gravel) was the fastest to recover, followed closely by the synthetic aggregate.

Holistic design

Now, does this eighth-grade science fair project demonstrate that one form of drainfield product is better than another? I don't believe so, because one attribute can't be the single factor that determines good or bad performance.

To truly evaluate a product, you have to consider how all the attributes function as they relate to the system as a whole: hydraulic loading, organic loading, gas exchange and surge volume. It's the holistic approach to design and evaluation.

Septic systems do require storage volume, but the minimum amount needed based on the flow capacity of the soil should be the determining factor in state regulations. A product only needs to meet this minimum, because more static volume is not better and, as the science project showed, more can actually be detrimental.

I like to design products to solve problems, and there's no better resource than to consider how these problems are solved in the world that God created. My wife used to teach breastfeeding classes, and she was quick to remind the participants that "the system wasn't designed to fail."

Nature can be very inspiring if we take the time to observe it. To me, it's only common sense to design systems to accommodate an occasional surge volume of two to three times the actual daily flow volume. Then, the system can easily handle such events as family gatherings, Super Bowl weekends, or flu season wash days. Remember, these are called drainfields, not storage trenches.

Are you still humming? I hope the next time you hear someone start talking about the need for "such and such storage volume" in a drainfield, you'll share the story of the crawdad. Theo said he'd like to keep a couple of crawdads for pets (or bait?), so we're off to find some. After all, they are fairly smart creatures.

Now how does that second verse go?

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