


Going With the FLOW

*Tom Dugan helps farms
stay well watered*

BY AMANDA H. DUCKWORTH
PHOTOS BY ANNE M. EBERHARDT



In a world of convenience, it is easy to overlook one of life's basic necessities. If you are lucky, nature provides water in an abundant supply. You just have to know where to look.

While horses amble through the rolling fields around Lexington, another world is going on not too far below the surface. Springs and natural wells have been created by Mother Nature but go largely unobserved by man. However, Tom Dugan, a geologist by trade, has made those underground water systems his livelihood and his passion.

"Groundwater is important," Dugan said. "I like to call it liquid gold. It is valuable, and a lot of people don't even know it exists underneath their feet."

Dugan refers to himself as part geologist, part plumber, and part scientist. Indeed, when he describes his trade, he resembles a lovable seventh grade science teacher who desperately wants his students to respect the power of the environment.

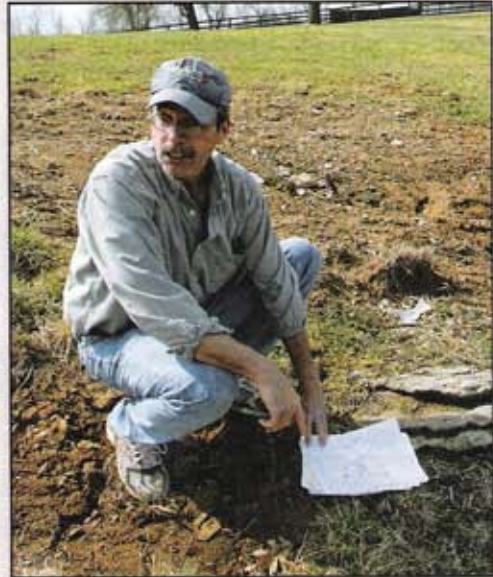
His career as owner of Bluestone Geologic in Lexington centers on finding water under people's property. Most of his clients in the area are horse farms and golf courses.

"They have evolved into the two big clients," Dugan said. "I didn't know who the clients were going to be when I started this. I began in 1984, but got out of it to do environmental work. I came back in December 2001 and pretty much had to start from scratch again."

As a geologic consultant, Dugan goes to the site in question and, using tools and his knowledge, determines whether or not the property is conducive to having a well system installed. Word of mouth serves as his biggest advertising, and the first step for clients is deciding whether they want well water or city water. The information Dugan provides can be vital in this decision, and if they want city water, his job is done.

Each type of water system has its pros and cons. City water is dependable, purified, and convenient. Well water is free and some believe its higher mineral content is beneficial to horses. While Dugan would love for all of his clients to decide on well water, he realizes it is a personal choice made from several factors.

"I can have farms right next to each other, and one loves well/spring water and one loves the convenience of city water," Dugan said. "That is their choice. That is part of it—handling whatever a client's need is." >>



Tom Dugan: part geologist, plumber, and scientist

Tom DUGAN

One of Dugan's clients, Brereton Jones' Airdrie Stud, is a big believer in the value of well water. Last fall, Dugan drilled a well for a newly purchased piece of the farm, and now newly built barns there are on a well system.

"We believe that the minerals in the water are bound to help put bone on a horse," said Airdrie general manager Tim Thornton. "We would rather do that than city water. We do have some parts of the farm on city water, but whenever we can have a well, we let the livestock drink well water."

On the other hand, it is not always cost effective for a farm to use well water. This was the case at Dr. Tony Ryan's Castleton Lyons when Dugan evaluated an existing pump system on the farm.

"We have a pressure tank, and it has been there since the 1950s or '60s," said estate foreman Darrell Edwards. "By looking at what it was going to take to make me feel comfortable to get that system up and running, it was considerably cheaper to go back to city water."

Then again, there is no guarantee that any piece of property will have enough water underneath it to sustain its needs. Dugan uses several steps to determine what nature has provided.

His first level of investigation involves using existing topographic and geologic maps as well as aerial photography. However, the field check, which is step two, is more critical in determining the availability of water and is a large part of why Dugan enjoys his job.

"Part of my thesis work was using equipment I have adapted for ground water exploration," Dugan said. "It is a current-based battery in a little box, but it is so small and compact that it is really adaptive to the field. You take readings and develop a profile of the ground water characteristics right under that profile line. It works pretty well, and I use it to locate faults."

Faults are a main source for water, as are conduits (what lingo terms "cool lingo" for cave systems), and both have their pros



Dugan prepares to pump test a well at WinStar Farm

and cons. Although both are good sources of water, cave systems are very precipitation dependent, and faults, due to their nature, will always leak.

While most water systems will never be observed by man, on occasion, sinkholes will occur over the underground cave systems, giving people a chance to see what Dugan calls the "underground plumbing."

Dugan also looks for other indicators of existing ground water, and because of the scale of topographic maps, it is not uncommon for smaller indicators to go unmapped. Sinkholes are good indicators of a karst system, which is a passage dissolved out of an underground cave.

"It is really matching up conditions with the situation on the farm," Dugan said. "The best odds are probably 70-30 or maybe 80-20, but sometimes it's 20-80. That is when I say 'don't try' because it is expensive."

A well in Central Kentucky is generally 150 feet deep, and it costs an average of \$10 a foot to drill, so you don't want to drill where there is no water. Dugan selects his drilling spot based on several factors, including the available water source, the area of use, and cost.

"You drill with a bit that is only six inch-

es across, and you are punching a hole in the ground trying to hit something that is only five feet wide," he said. "The exact spot (to drill) tends to be as close to where you want to use it because the longer you have to pump water, the less volume pressure you have."

"Another strictly logistical reason is because this is not only going to be the place where they use the water, but the same trench line that will put the water line up to the barn will carry the electricity back to the submersible pump in the well. Everybody considers cost, and you would be crazy not to."

Because many older properties have existing well systems that have gone out of use, Dugan is sometimes called in to examine what condition they are in. Such was the case at Bill Casner and Kenny Trout's WinStar Farm, which has four wells on its property. The farm uses city water but has used the maximum number of access points into the municipal system and is looking into using the existing wells for landscaping purposes.

Dugan was called to pump test the wells to see how much water they produce per minute. In WinStar's case, the well involved in phase one was found to pump about seven gallons a minute, which



Topographic maps are one of Dugan's tools

means more than 10,000 gallons a day. The happiness over finding water when pump testing the system was clear, but disappointment was intermingled because of the relatively low rate of flow. The average well in Central Kentucky produces 10-20 gallons per minute.

Because of silt accumulation over time, Dugan thinks cleaning and deepening the well will almost certainly increase its production. WinStar is currently deciding what to do.

"We still haven't made a decision," said Joel Roff, a horticulturist for the farm. "Right now, it has been put on the back burner a little bit with the Kentucky Derby coming up, since we are trying to get the farm in shape to be visited by hundreds of people."

Dugan explained that to find the quantity of water a well must produce, you tally up the need on the farm and make the assumption that everything could be on at the same time.

"You may come up with a number like 25 gallons a minute, and if I drill a well that is 10 gallons a minute, the supply does not meet the demand," Dugan said. "However, you can utilize some temporary storage because that 25 gallon/minute demand is instantaneous and isn't consistent across 24 hours."

Once a well is found and deemed suitable for the farm's need, Dugan sends samples to laboratories to test the water for mineral and bacteria content. Part of the maintenance for existing wells is making sure the water is pure enough for livestock use. Treatment systems are added to the well to reduce the levels of contaminants to acceptable levels. Often, human standards are used to determine the water purity because equine standards do not exist. However, that is one field that is beginning to be investigated.

"Minerals are all good up to a certain point, but then after that they are all bad," said Don Kapper, who is the director of equine nutrition for Progressive Nutrition and a member of the American Registry of Professional Animal Scientists. "For example, usually the size of the molecule of iron in water is so large that it can't be absorbed. However, it can interfere with phosphorous absorption in the gut. If we get too much iron, then we end up with phosphorous deficiency, and phosphorous is a key metabolite in about every metabolic pathway in the horse."

"For every action there is a reaction. When you are dealing with water you are looking at what is there and what it can affect indirectly."

When water is used on farms for landscaping purposes, iron content still needs to be controlled because buildup will affect the sprinkler systems. Sulfur is another common element that can be too abundant in Central Kentucky ground water

Age: 53

Family: Daughter Erin, 24

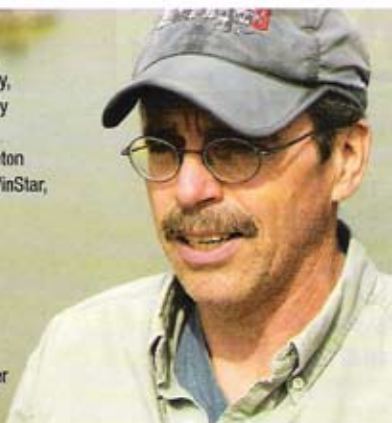
Education: Master's degree from Eastern Kentucky University, bachelor's degree from Southern Illinois University

Business: Bluestone Geologic

Clients: Adena Springs, Airdrie, Brookdale, Buck Pond, Castleton Lyons, Hill 'n' Dale, Richland Hills, Three Chimneys, WinStar, Shadwell, Stonestreet

Key Things to Remember:

- City water versus well water is a personal choice
- Not every farm will have ground water
- Every site is different
- Every well has its own "fingerprint" of minerals
- If you find water during a drought, you will always have water
- Well water will require maintenance



and needs a treatment system to take care of it.

"Every well, spring, fault line, and conduit system is different," Dugan said. "Each one has its own fingerprint. The ground water is not one big blanket, it is highly variable and specific, usually to a farm, and it can vary across the farm too."

Once a well is drilled, tested, and ready to go, the level of installation Dugan performs depends on the client. Some do more in-house work than others, and Dugan's level of interaction during installation and regular maintenance depends on their needs.

"The well is basically controlled by a pressure tank that senses a demand," Dugan said. "When you turn a hydrant on downstream, the pressure drops, and it detects it here and kicks the pump on."

The cost associated with wells is site specific and depends not only on Mother Nature but on what systems may or may not already be in place. Dugan said from start to finish, the low range to install an entire system is \$4,000-\$5,000.

Besides finding water and installing wells, Dugan is trying to branch out into

exploration for sinkhole potential. Several farms have already used his knowledge of ground indicators to locate areas on the farm that have a large potential for sinkholes.

"Primarily, it is to eliminate one risk factor and help protect the well-being of their investment," Dugan said. "That's the hope; to get ahead of them before they happen. It is kind of a prediction game."

Dugan returned to water exploration because it is his passion, and it is the hunt that drives him, whether it is for water sources or potential sinkholes. He has combined his love of science with the thrill of the hunt to create a successful one-man show of water exploration. In peak seasons, he will bring in an additional two to three people to help, and also utilizes students at local universities.

"It isn't something that came up in specific classes or anything in my background. It is less tangible," he said. "It is kind of like a treasure hunt for that hard-to-find thing because it isn't that simple in this neck of the woods to succeed. I think I have gotten a program down that works, and I always like to succeed for the client." 📍



The flow of a well is measured by how many gallons per minute it produces