by Jon Steele

Helping Camp Lakeside with water quality issues – what a great summer experience!

Several months ago, the Kansas Department of Health & Environment requested KRWA's assistance to check out and assist Camp Lakeside, a church-related facility at Lake Scott near Scott City in far western Kansas. The problem was repetitive positive samples for coliform bacteria. I was not familiar with the Camp, or Lake Scott. When I arrived, I nearly asked myself, "gee Toto, this cannot be Kansas, can it?" Kansas Highway 95 loops and winds through a beautiful canyon with a 100-acre lake at the bottom. Lake Scott is operated by the Kansas Department of Wildlife and Parks. Before I explain the water system clean up, here's a little more about Lake Scott.

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It's beautiful, and a complete surprise to many, including me! *National Geographic Magazine* named it one of the 50 'must see' of our nation's parks. Lake Scott is one of the 24 finalists in the present "8 Wonders of Kansas" promotion by the Kansas Sampler Foundation (see www.8wonders.org).

The area is etched out of the Ogallala formation by Ladder Creek. The El Cuartelejo ruins are found here. Named a National Historic Landmark in 1964, the ruins are all that is left of the northern most pueblo in the United States. It was constructed by a group of Taos Indians who wanted to live free from Spanish rule in the 1600s. They lived there for about 20 years, building irrigation canals to carry spring water to their crops. Eventually they returned to their native area. The pueblo was next occupied in 1701 by a group of Picurie Indians who only lived there for a couple of years. In 1717 Juan Uribarri opened a trading post from the structure, making it one of the first white settlements in Kansas, far from the eastern border of the state. He operated the trading post there until the late 1720s when El Cuartelejo was abandoned for the final time. In the 1890's archeologists from the University of Kansas excavated the site. One stream called Big Spring currently flows 58-degree water at the rate of 400 gallons per minute. This spring can be observed from one of the nature trails in the area. Just outside the park along Beaver Creek is the site of the last battle of the Indian wars in Kansas, on September 27, 1878. The U.S. Calvary was beaten back by a band of Northern Cheyenne after escaping a reservation in Oklahoma. Chief Dull Knife and Little Wolf led the Indians; they

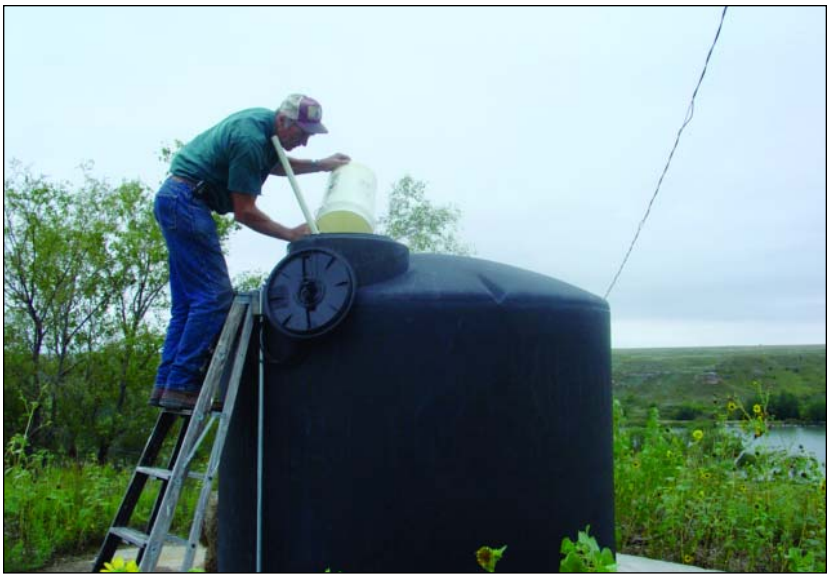
PHOTO BY HARLAND SHUSTER

Lake Scott State Fishing Lake is located in the 1,020-acre Lake Scott State Park, 12 miles north of Scott City. The park is a startling oasis of natural springs, deep wooded canyons, and craggy bluffs.

fled north to Nebraska killing settlers in Decatur County along the way.

Camp Lakeside sits just a few feet off the lake and was originally started in the 50s from a private land donation. It is affiliated with the Methodist denomination but is open to anyone for workshops, church groups, conferences, weddings, or other get togethers. Facilities include a large dinning hall, cabins, meeting halls, hiking trails, a pool and lake recreational activities.

Upon arriving, Park Supt. Reed Rolfs and I planned a course of work. First we would clean the wells. While the portable tanks that were to be used for the well treatment were filling, Reed gave me a tour of the facility. With so many individual plumbing fixtures it was obvious there would be a lot of back and forth, flushing and checking chlorine residuals in all the buildings and outside hydrants. We went to the top of a hill where the system's 2,100-gallon poly storage tank is located. The original riveted steel tank was replaced by a wooden tank which was in service until a couple of years ago when they installed the current poly tank. The tank is a black, opaque poly material to keep sunlight from penetrating. If sunlight penetrated the tank, algae could form creating water quality problems. Almost all water contains some nutrients. An ideal environment for algae growth exists when the nutrients are exposed to sunlight



Lake Scott Park Supt. Reed Rolfs adds chlorine to the Camp Lakeside black poly ground storage tank.

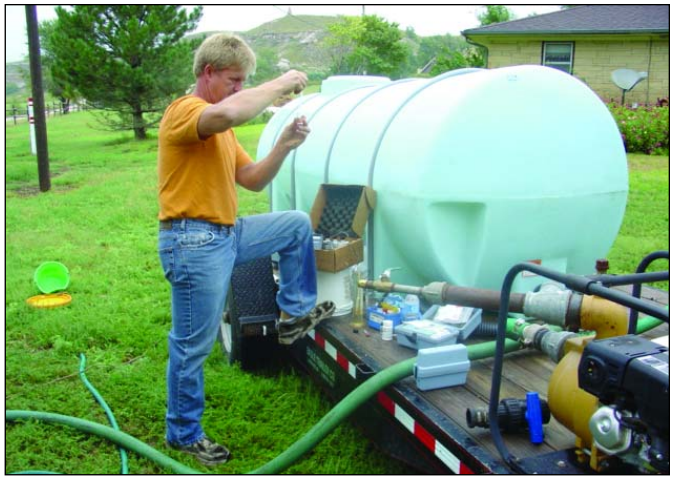
and warm temperatures. Just visit the nearest stock tank in the summertime. Most are pretty overgrown with algae and moss. A black tank also gets really hot in the sun.

An inspection of the tank revealed fluffy material swirling around inside when the pump was running. It was difficult to tell exactly what the material was, looking in through the top of the tank with a flashlight. We left to get the necessary items to drain and clean the tank. After returning back to the camp, we noticed that the water from the hydrant we were using to fill the portable tanks had a greenish brown tint. I was a little puzzled by this at first. I drained the 300-gallon tank that KRWA uses on these well-cleaning jobs and began filling it again. Since the well is in such close proximity to the lake I wondered if somehow lake water could be influencing the well water. The water looked clear coming out of the hose but in a large amount you could see the high turbidity.

Tasting the water indicated to me however that there was an iron problem and that the discoloration was due to reaction of chlorine with the iron in the water.

With that conclusion, Park Manager Reed Rolfs and I went back to the storage tank to begin the clean-up job. While draining the tank we could see some of the fluffy material as it ran across the concrete slab the tank sat on. The material was red-orange in color, again indicating heavy iron content. The fluffy form of the material told me that it was a by-product that forms when iron related bacteria is present. The tank was cleaned with a strong, 500 mg/l chlorine solution. This solution was allowed to sit in the tank and throughout the entire system overnight.

That evening, we mixed and pumped a 1,000-mg/l chlorine solution into the well. Talk about some stained water when that much chlorine is added to water that has a high iron content! The water resembled tea. We allowed the solution to sit overnight. The next morning we surged the well by starting and stopping it to mix the solution more in the well; we also refreshed the process with more highly chlorinated water.



KRWA Tech Jon Steele is shown checking water chemistry after the treatment solution was introduced and surged in the well.

Next, we drained highly chlorinated water throughout the distribution lines. All plumbing fixtures were flushed and monitored throughout the day for chlorine residual. Extremely low flows in the kitchen caused us to investigate further. Head Cook Marilyn Rhodes Fischer reported they had dealt with the low flow problems all summer. We traced out the plumbing lines. Older lines were generally copper so I would not have expected plugging as bad as with galvanized piping. However, I found a cartridge filter ahead of a water softener. The filter was completely plugged with biofilm slime. I removed the filter for the duration of our flushing.

Camp Lakeside is located on the banks of the 100-acre Lake Scott State Fishing Lake. The camp is affiliated with the Methodist and Church maintains a beautiful chapel, seen in the middle left of the picture, as well as several other structures seen scattered through the trees.

We found the same situation in another building. Removing the filters dramatically increased the flow rates. There's a lesson here. A water treatment system is no better than the regular maintenance that is performed on it. A system that is not well maintained is not worth having and the water quality can even be much worse than not having a treatment system at all. These filters were breeding grounds for bacteria.

Another batch of the chlorine solution was introduced into the well for a total of 3,000 gallons of treatment. This was again allowed to sit overnight in the well and then surged again the next morning. In a clean up process, chlorine residuals should be monitored and adjusted after the solution has remained in the well after several hours. As the chlorine is working to destroy bacteria and break up the biofilms it is consumed and likely needs to be refreshed.

The water system clean-up at Camp Lakeside turned out to be a long three-day project. I am confident we made a lot of progress. Subsequent sampling indicates no presence of coliform bacteria.

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The camp's well is located in the worst possible location, being down gradient from all buildings at the lowest point on the property. Each building has its own septic system. I recommended that the camp take a non-chlorinated monthly sample from the well in addition to their regular monitoring to determine if the ground water has become contaminated from the septic systems. The camp is installing a new infiltrator sewer treatment system that should go a long way to better protecting their water source.

I encourage you to call KRWA if your community has any questions or if you are interested in discussing water quality or supply issues. If we can't help, we'll find someone who can, and will.