

Passing a Tough Test

by Brad Longstreet

"I spent about three weeks up there – I wouldn't have missed it." says RLS founder Shane Loyd, PLS (Professional Land Surveyor) about his work on the soon-to-be-completed Cumberland Trail in Tennessee, "but I have to admit, I was glad to get home too!" RLS, based in Chattanooga, Tennessee, has been around since 1999. Starting in 2007, they began to offer scanning and have established a good reputation for applying cutting edge techniques and equipment to surveying projects. On the Cumberland Trail project, the survey equipment used was a Leica Viva GNSS system and it was about as cutting edge as possible: "We picked up two systems and I think we were the first firm in the South to have one," says Loyd, laughing, "Even the Allen Precision (Leica Geosystems' dealer in the US) guys hadn't been fully trained yet, so in some respects we were on our own. We got them out

of the box and drove straight to the job, so it was a tough test for new equipment. Fortunately, the system worked great."

The Cumberland Trail in Tennessee, inspired by the popular but crowded Appalachian Trail, begins at Cumberland Gap National Historic Park and ends just outside Chattanooga. Currently, 190km (118mi) of trail – out of more than 480 proposed kilometers (300mi) – are completed, and remaining sections are being added about as fast as they can be surveyed and developed. The 30km (19mi) section surveyed by RLS stretches from the park to LaFollette, and includes the historically significant McClean Rock, where Justin Wilson and others are said to have been standing when they conceived of the trail.

In this case, the Molpus Timber Company, along with several private owners, owned most of the land being acquired for the trail. Legal descriptions and maps were needed to complete the transfer, and RLS





crews also set rebar, boundary marker posts, and painted as needed to identify the trail alignment.



As part of the transfer process, a private group, The Trust For Public Land (TPL), temporarily owns new acquisitions before they are transferred to state agencies. Everyone involved wanted to minimize the period of private ownership, which explains the short time frame of the survey. "The negotiations involved kept pushing back our start date," Loyd says, laughing, "but somehow that didn't push back the due date. We'd originally planned on six months to do this work, but ended up having to do it in three!"

Why in Winter?

During the eleven weeks that RLS crews worked and camped in the Tennessee bluffs, a total of 1.5m (60in) of precipitation fell. Snow was bad enough, but "rain was worse," according to Loyd, "because we'd get soaked, the equipment would get soaked, and rainy days were still extremely cold." Many days were so cold and uncomfortable that work would stop midday just to build fires and warm up. And because winter light is scarce, workdays were rela-



tively short and crews would cook, melt water, and tend to survey chores in the dark. All of which begs the question, "Why do this project in the winter?"

"Even with the cold and the snow, winter was better," explains Loyd, "because of the deciduous foliage, it was easier to see and to get around without clearing a lot of brush. This was a major factor for us when using the Leica Viva GNSS system in order to meet our deadline." The area is also "snaky", with large populations of rattlesnakes, copperheads, and even bears that hibernate in winter.

So, all things considered, winter really was the best time. But that meant that surveying, camping, cooking, battery charging, calculations, and all the other business of life and work had to take place in extreme conditions, several hours from the nearest city. It was a severe test for both humans and survey equipment.



Surveying the Trail

The actual project requirements were straightforward. RLS was asked to locate and mark underly-

ing parcels in the area, create a 60m (200ft) wide trail corridor, mark the corridor with rebar, boundary markers, and paint, and provide maps and legal descriptions of the corridor. Simple enough as boundary surveying goes, but in addition to the ever-present weather and terrain difficulties, there were other significant challenges.

"Parcel descriptions around here go back to the North Carolina Land Grant of 1785, before Tennessee was even a state," Loyd explains, "and the scribed trees that were called to just don't exist anymore. Other descriptions made very vague calls like 'bluff lines' or 'top of ridge' and it can be very hard to know exactly where these lines are now."

Even though this wasn't a topographic survey, interpreting available descriptions meant that bluffs and other features had to be located. "With all the one-to-one slopes out here, and the snow cover and the brush, traversing with total stations would have been ridiculous," says Loyd, "Fortunately, the Leica Viva GNSS system really came through for us. We put it to the test and we were never disappointed by the reliability, accuracy, and durability of the equipment." On a good day, crews could locate about two miles of ridgeline a day, sometimes crawling through mountain laurel patches to find clear spots. In some areas, a real-time kinematic network, operated by the Tennessee Department of Transportation, was available and in other areas RLS relied on static surveying. "We always had the coverage we needed," Loyd says, "We did have some issues on the northwest side of steep ridges, but even there we learned what times of day we could work and it wasn't a problem."

Loyd, and Project Manager Scott Carter, PLS, also gathered a lot of parol evidence to help with boundary work. Owners would come out on weekends, on four-wheelers, to meet with the surveyors and relate what they knew about boundaries. In many cases they had knowledge of longstanding agreements about the precise location of vague topographic calls, or could point out the minimal existing monumentation. "In the entire 30km (19mi) we surveyed," says Loyd, "there were only about 20 points I could really 'hang my hat on.' But with the evidence we gathered we were able to put together a solid boundary."

A brand new survey system and data interface could have been a problem, but the Leica Viva system



worked very well, according to Loyd. "We've been using Leica Geosystems products for a long time, and we were sure the new system would work out." Even so, Loyd and Carter were very happy with how quickly employees picked up the new system. "It took just a few hours and everyone was able to do everything with this system," says Loyd, "the menus and the buttons are very clear, we were getting satellite lock with exceptional speed and reliability, and everything held up well in the cold and damp. Basically there was no learning curve. We couldn't be happier with how well Leica Viva GNSS worked for us."

Since part of the job was to create and mark the corridor on the fly, crews used the Viva Field to Office feature with the cellular link to upload data at the end of workdays. An RLS office technician would stay late to download the data, calculate an alignment, and upload the alignment to the site. In the morning, crews would log in, download the alignment, and get to work. "We could have done the calcs in the field," says Loyd, "but that would really have cut into the

time available for survey work and camping chores. The cellular links worked very well for us and made life a lot easier."

Living Rough

In some ways, the Cumberland Trail project resembled surveying from the sectional survey days. Crews spent weeks in the field, living rough; and dealt with tough conditions every day. In other ways it seemed like the future thanks to the use of progressive GNSS systems, cellular uplinks, and personal GPS beacons. By bringing together the skills of the past and equipment of 'right now', The RLS Group was able to complete a project that will benefit future hikers for generations to come. ■

About the author:

Brad Longstreet is a freelance writer specializing in land surveying, GIS, and laser scanning technology.