



Work started at this trailhead in Wayne National Forest near Marietta, Ohio

Hit the Trail

While mapping a forest trail system a small surveying firm learns advantages of a GPS receiver equipped with a camera, dual-constellation-satellite reception, and high-accuracy capability. Now, they're tackling more types of work, including a heavy dose of GIS.

Marietta, Ohio. And this lesson applies to several other types of work the firm is bringing in as well.

In the forest, a Robinson crew consisting of Chuck Goshen, Josh Appleman, Andrew Lonneman, and Robinson, accompanied by Pam Blackburn with the Wayne National Forest, used a Topcon GMS-2 GPS receiver to acquire data to populate a GIS database. Using TopSURV-GIS ESRI-compatible software, they were able to download field data directly as a shape file. Such a receiver can be used by itself with sub-meter accuracy or as a controller in an RTK system with centimeter-level accuracy.

Robinson also learned the value of having a camera integrated with a receiver. "With the camera feature inside, it allows us to come into the office and immediately download our digital data collection points with the photo attributes tied to that point automatically into a shape file that can be read by the ESRI software," he says. "In the past, we had to coordinate the photo number with the point number and manually attach those individually. When you get on a large project where you have 100 or 200 photos, it's easy to get out of sync. You have to be much more cautious in the field, and a lot of office time is needed to coordinate those photos."

The company photographed all the trail maintenance areas, trail signs, and pertinent features such as benches, intersections, and trail blockage. Forest service employees can pull up any feature on the map. Double-clicking on a point displays any selected photograph taken in the field. This allows employees to share detailed information in-house without revisiting the site. Field rangers can instruct summer interns about trail-blockage removal before leaving the office. Tools and equipment needed for the job can be discussed without the ranger taking the crew to the actual site, saving valuable time for the ranger.

Robinson's company also ran an "auto topo" feature out of the unit, which created a 3D poly-line to determine the actual traveled length of the trail. This is important to determine how much material will be needed for any required trail maintenance.

By Tim Rand

GIS work can take you from busy inner-city streets to quiet remote trails in one of our national forests. Flexibility and ruggedness in equipment is essential for doing the tasks needed in the different type of work environments, not to mention speed and accuracy.

Bruce Robinson, a registered surveyor and engineer and owner of Akron, Ohio-based B.L. Robinson Engineering & Surveying, learned this recently when his company performed mapping work for trail management at Wayne National Forest near

In addition to the internal camera, the receiver also incorporates an internal electronic compass. This feature allows you to store orientation for the pictures. "It's a very valuable feature," Robinson says. "We are going to head into the environmental field helping with wetland surveys and other types of tree inventory surveys and similar projects." The compass orientation allows any user of the data to lay the photo on the print to determine from which direction the person took the photograph.



← Shown checking his notes, Bruce Robinson sees his firm branching into different types of work, yet remaining small

↓ Pam Blackburn of the Wayne National Forest works with Chuck Goshen as he marks a point

Camera Allows Expanded Uses

The integrated camera was key to Robinson for many of the projects his firm is undertaking as well as for other company projects planned over the next two years. "We envision using the receiver for our erosion control inspection on projects. This allows us to come into the office, download our field data, put it on the map, and email it out. We can do our report, and then anybody from any remote environment with ArcReader software can double-click on all points of interest and view the photos immediately. It's an excellent collaboration tool."

Chuck Goshen, a company field surveyor, does a lot of the precision fieldwork. He talked about the ability of Robinson to look at jobs he can complete on his own using the handheld unit with the internal GPS. "Bruce will go out and look at jobs that he can do in a couple of hours," Goshen says. Robinson will capture points that don't appear to match the job plans. He wants additional survey work done by his staff in these areas. This communication tool saves time when dealing with 80-acre projects. "We can come back later, incorporate it with the receiver, and tie it in for him at survey accuracy depending on the job," Goshen says.

Some jobs don't require sub-centimeter



↑ Using a Topcon GMS-2 receiver with camera, points and attributes were entered to populate a GIS database for the trail

accuracy; sub-meter accuracy of positioning works just fine. But Robinson sees his clients' engineers pushing for more precise, centimeter-level data on every job. High-precision data brings cost savings and other obvious benefits when a county, municipality, or private utility has survey work done. The engineers can use the cadastral work and GIS mapping data for engineering projects. Robinson explains that high-precision data is important when documenting storm sewers, sanitary sewers, and

water lines where accurate elevation information is important.

Robinson says the new type of GPS receiver will "cross over into that market because you have the ability to asset inventories and things like that at a sub-meter level in addition to having the flexibility to use it as a handheld controller for an RTK survey system for more accurate measurement." He continues, "The field staff may need to go out and do a storm sewer inventory or an outfall inventory, then get a picture of the outfall so they can see if it's obstructed, if it's eroding, if it needs maintenance ... whatever they want in the attribute table. Also, they will have a precise elevation and location of that outfall. This helps when they start going back to analyze flooding, for example, where they need very precise data."

The firm uses the Topcon HiPer Lite series for their RTK projects. The GMS-2 is used as the controller and is wirelessly

connected to the rover using Bluetooth wireless technology. The RTK rover can operate up to 1.5 miles from the base radio transmitter (radio transmission must be unobstructed).

As Robinson explains, "Probably 80 percent of our survey work supports our own in-house engineering. We are moving on and getting the company involved in GIS and understanding the surveyor's role in GIS, which is something I have been interested in since the early '90s. The new receiver will get us into this GIS space and help us become survey support for the various counties and municipalities and the other people using GIS."



Attributes logged into the GIS database include trail obstructions such as this fallen tree



RTK Network a Boon

Robinson expects to get heavily involved doing more asset inventory for private utilities and municipalities. For these projects, the GPS receiver will be used with the Ohio Department of Transportation (ODOT) Virtual Reference Station network now under development and in the testing phase.

When it comes to fruition, B.L. Robinson will take advantage of the ODOT VRS network of precision reference stations for other projects as well. In providing on-the-fly correction, these reference station networks can support sub-meter differential GPS (DGPS) with the GMS-2 or high-precision RTK work with the Topcon HiPer Lite. Instead of setting up a base station on a known point, users can receive the correction signal from this network. As the rover moves within the boundaries of the network, the network continuously assigns the closest base station to provide the correction data. Goshen reports, "Before, we were saying a mile, mile and a half. Now we have no limitation. Now all we do is set up the rover, and we are jamming!"

The high-precision reference station network will also help in cellular tower certifications. Their grades have gone from 2C to 1A, which requires precise information. Previously, in remote areas, they had to go several miles to pick up a geodetic monument to certify to the 1A accuracy. With the network, searching for a monument is no longer necessary. Team member Josh Appleman adds, "We have four rovers so, with the help of the ODOT network, we can essentially have four guys working on one project, and our productivity is going to be fabulous. You'll be done with that job and on to the next."

Two Constellations Are Better Than One

Robinson recently started taking advantage of another benefit of the new receiver while doing a utility pole

inventory for a rural electric municipality in Etna Green, Indiana. The ability to use satellites in the GLONASS constellation as well as the GPS constellation made possible the completion of this inventory during the summer months. Some of the utility poles were located in a trailer park next to trailers, which blocked much of the sky. In addition, some areas had heavy tree canopy, also blocking huge portions of the sky.

"Without the GLONASS, we would not have been able to complete this project this summer. We ran into situations where we were picking up two GPS satellites and four GLONASS satellites," Robinson recalls. "We realize that without the GLONASS, we could not have done it this summer either. We ran the GLONASS on the RTK system."

Another area of work that has developed in the last year for B.L. Robinson is in the oil and gas industry. The Ohio Department of Natural Resources (ODNR) has taken jurisdiction over oil and gas development. One of their project requirements is to have aerial photography overlays with the survey work. BLR has 480 Gb of aerial photography and base map data for all 88 Ohio counties. In addition to acquiring points and photographs, the GPS receiver will be used to assimilate the aerial photographs. Together, the imagery, digital photographs, and GPS data will be emailed to clients to streamline positioning the new wells and tanks.

Benefits of the new GPS receiver arrangement keep coming as members of B.L. Robinson Engineering & Surveying continue using it. The portability with an integrated camera in a unit that can be used on its own or as a controller in an RTK system continues to work well for the team. The new work opportunities the company is developing are enhanced by the speed and flexibility of their unit. And in tough canopy environments, it uses dual-constellation satellite reception. As a net result, Robinson says, "It has allowed us to stay a fairly small company and compete with large firms because of the efficiencies we have picked up in the field." ▼

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