

The evolution of wetland restoration site assessments

Advances in surveying technology allow Minnesota Board of Water and Soil Resources (BWSR) engineering staff to assess potential wetland restoration sites in a fraction of the time it took to complete similar work 20 years ago.

Collecting and evaluating detailed elevation information is an important initial step. Data collected helps determine a project's feasibility and provides critical information like tile depth, existing water elevations, culvert information and property boundaries.

Twenty years ago, it would have taken at least 70 hours to collect site data and prepare a comprehensive topographic site map for a 120-acre wetland restoration. That sort of project required a survey crew of at least three people collecting and recording each survey point (AKA shot) to develop a topographical site map. Assessing a 120-acre site in Rice County would have involved two full days of travel and data collection. Preparing a site map would have taken up to three days' office time.

BWSR engineers help soil and water conservation district field staff evaluate potential wetland restoration projects for BWSR conservation programs such as the Minnesota



Right: An engineer uses total station equipment — a traditional system — to collect elevation data.

Photo Credit: Karen Bonde, BWSR
Below: GPS survey equipment is mounted on an ATV during a site assessment in Rice County. Mounted equipment improves efficiency for field engineers compared with total station equipment.

Photo Credit: Siri Doyle, BWSR

Conservation Reserve Enhancement Program (MN CREP) and the Local Government Road Wetland Replacement Program (LGRWRP). That work has changed, too.

Today's tools — including GPS survey equipment, Light Detection and Ranging (LiDAR) remote sensors, and all-terrain vehicles (used to mount equipment on) — allow staff to efficiently complete field work and develop comprehensive topographic maps. Those tools allow staff to finish site assessment work in roughly a quarter of the time compared with 20 years ago.

The average site survey now takes 16 to 20 working hours. Travel time to and from a site is often the biggest variable.

LiDAR gives BWSR engineering staff detailed topographic information



before they visit a site. This allows on-site GPS survey work to focus on critical areas and features, significantly reducing the number of staff and time spent in the field.

A recent MN CREP application for a large wetland restoration project serves as an example. Located in Rice County, this MN CREP application included 121 acres of

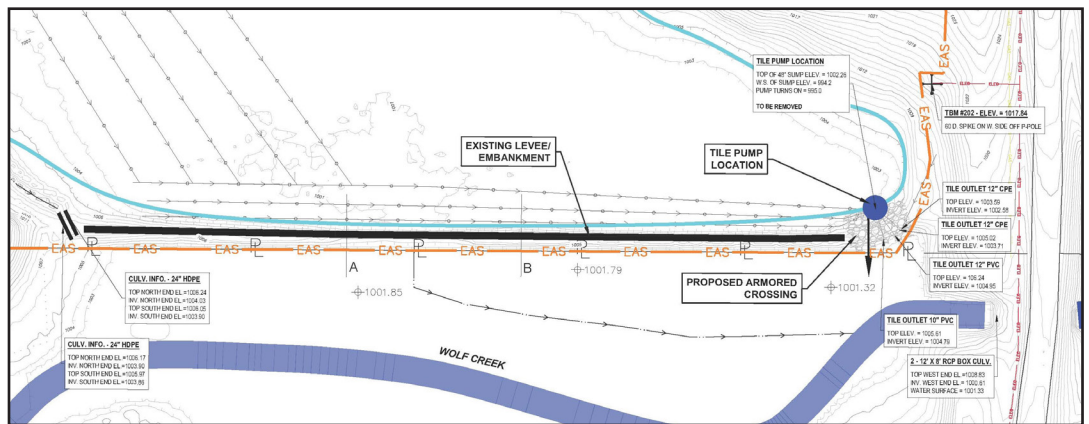
farmland, much of it within the Wolf Creek floodplain. A levee and embankment with a drainage lift station installed years ago made certain areas suitable for farming, and protected farmland from flooding. The lift station is fed by a vast network of drainage tile installed throughout the property's low-lying areas.

The wetland restoration aims to remove the existing lift station and breach or remove portions of the existing levee to reconnect Wolf Creek to this former floodplain wetland. While that seems straightforward, there were concerns about potential impacts to several neighboring properties and a county road bordering the north edge of the site. These types of concerns are typical. Addressing them requires a site survey.

During the survey process, critical elevation and other data were collected about drainage infrastructure including culverts, ditches, drainage tile intakes and outlets, pump locations, levees and other riparian features relevant to project evaluation and design. Staff also collected data on adjoining properties, existing roads, utilities and other infrastructure.

The survey field work took six hours. Analyzing the data and preparing project maps took eight to 12 hours.

Equipment today consists of a GPS receiver head and a controller that are mounted on a surveying rod or an ATV for easy mobility. When on the ATV, the receiver head is mounted in the front and the controller is connected above the handlebars. In the past, a total station setup on a tripod was used with



Top: A site map created with GPS survey equipment helps determine the appropriate conservation practices needed to complete a wetland restoration in Rice County.

Bottom: An expanded section of the above site map shows detailed topographic data for a critical area of the project site. **Map credits:** BWSR

one person managing it. Two people would hold the receiver head on a surveying rod and walk to certain areas to collect data while the person behind the tripod aimed the total station at them. With the new technology available today, a job site can be divided between two people with their own equipment, who can get the job done in a matter of a few hours; where in the past it took most of the day with three people to finish the job.

Modern survey grade GPS equipment can be expensive. A complete setup can cost upward of \$60,000 — excluding the cost of ATVs, trailers, probes, measuring tapes, and other generic hardware tools. However, BWSR Senior Water Resources Engineer Tom Wenzel said the time saved makes purchasing this type of equipment an easy decision.

“Over the next six years, BWSR is expecting to process

and manage between 400 and 450 individual wetland restoration projects of varied sizes and complexities,” Wenzel said. “Each of these projects needs to be thoroughly evaluated, surveyed and have a site map to prepared to facilitate necessary planning, easement acquisition, design and construction. With today’s equipment, we can manage that workload much more efficiently than we could in the past.”