

# Esri News

## for Forestry

Fall 2012

## Mapping Forest Data Workflows

### Hessen-Forst Enterprise Updates Its GIS Data Management System

By Wolfgang Fischer, Hessen-Forst, Germany, and Martin Stöcker, con terra GmbH, Germany

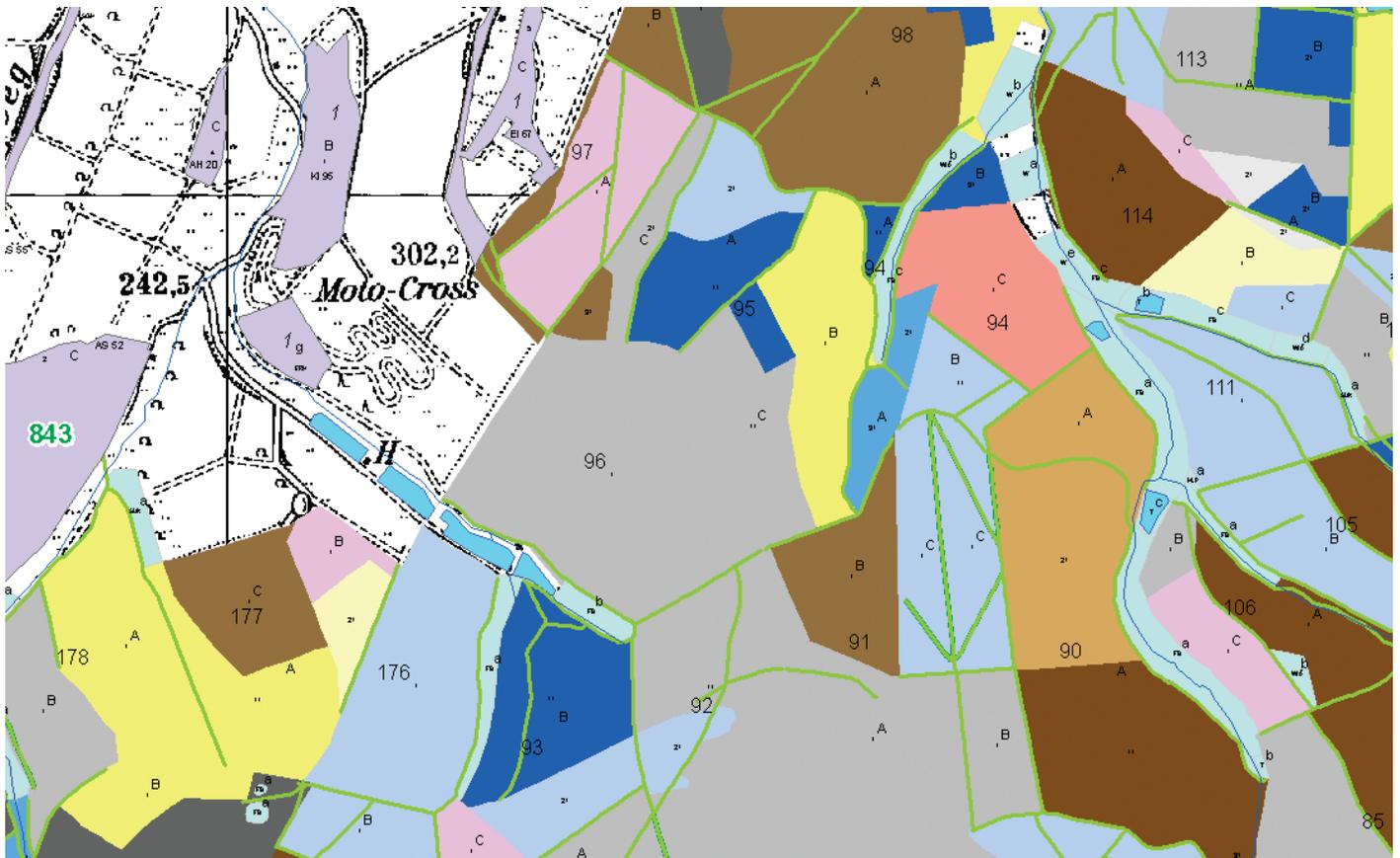
Creating maps about the volume and condition of forest stands begins with good data. A data management workflow that includes collecting, managing, handling, and provisioning forest data is integral for ensuring quality and accuracy within forestry management plans.

Hessen-Forst Enterprise is one of the largest forest organizations in western Europe. Its managers wanted to implement

a workflow management system for GIS data collection and editing processes. This would save time, reduce costs, and improve data quality. So Hessen-Forst asked Esri partner con terra GmbH to build a GIS data management workflow application specifically for its inventory processes. To do this, the GIS service company used Esri's ArcGIS Workflow Manager, an ArcGIS for Desktop extension,

to customize an automated job tracking system to help users successfully complete the organization's forest inventory processes. The workflow tools were combined with the forestry business's basic GIS tools package, FoBIS, and a data model.

Once Hessen-Forst implemented the solution, foresters began using the GIS to guide them through processes such as updating →



↑ Foresters use a GIS job tracking program to access data, tools, and symbols for each step in building a forest inventory report.

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## Mapping Forest Data Workflows continued from page 1

→ the inventory database after a heavy storm. ArcGIS Workflow Manager tracks the status and progress of the job and generates a detailed history of work activity. Its functions include job tracking, version management, multiple data warehouse support, history tracking, change detection, spatial notifications, and reporting.

To start a job, the user selects from a list of job types and job templates that outline the steps that need to be completed. The set of each job's operational parts is its workflow, which contains the steps required to complete the job. The user navigates the workflow using tools to complete the steps in the process.

For example, following the steps in a process, the user comes to a step and clicks a button to execute a smart launch of ArcMap. ArcGIS Workflow Manager sets up an environment in which the user will complete the relevant GIS and non-GIS tasks and shows an accompanying workflow diagram. When the user clicks a step on the diagram, it launches the tools and automated processes the user needs to finish the step. When done, the user clicks the Complete button and is ready to move to the next step in the workflow.

Hessen-Forst has used Esri technologies since it first began digitally managing geo-data. Today, all the enterprise's sectors have access to necessary geoinformation using Esri

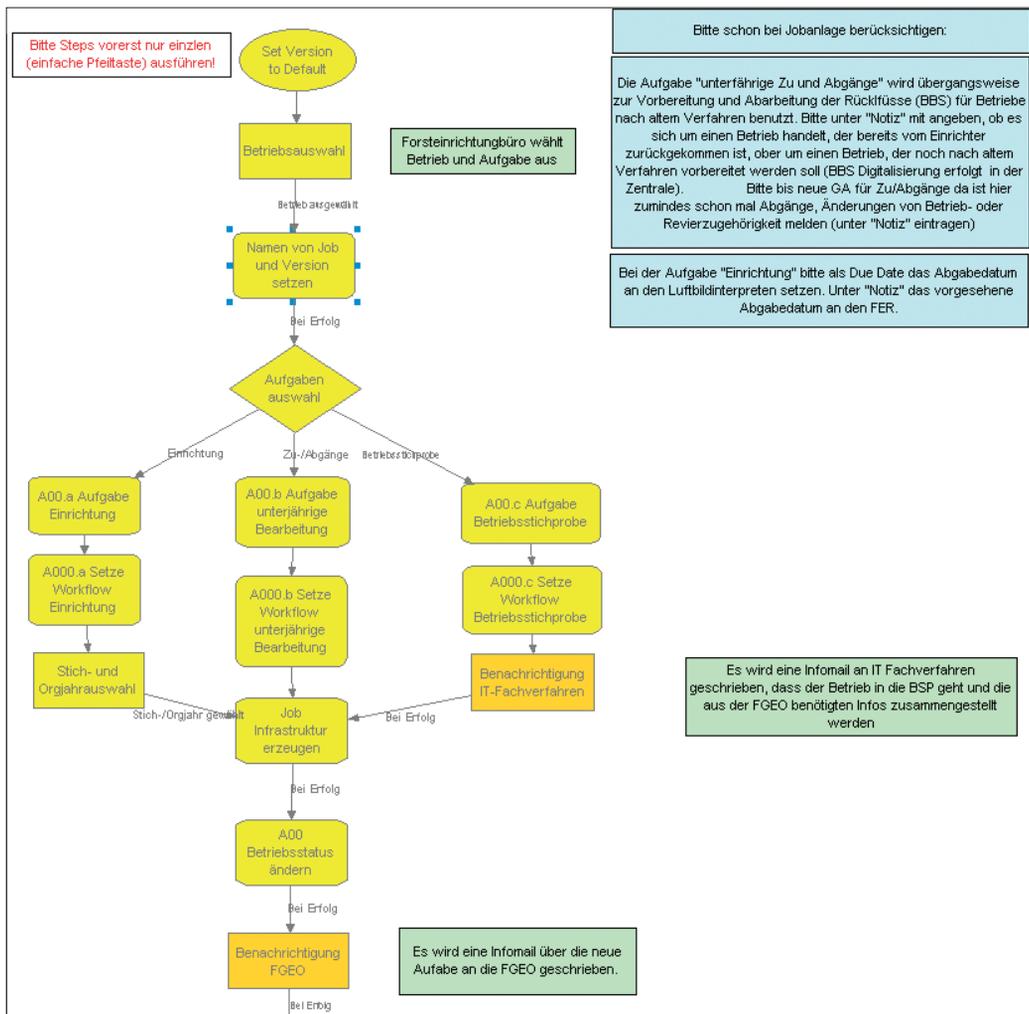
technology. The addition of the ArcGIS extension was easy for users to adopt.

"Because employees are already familiar with core ArcGIS technology, the solution is extremely easy for them to use," said Wolfgang Fischer, head of GIS development at Hessen-Forst. "ArcGIS Workflow Manager enables us to map all inventory processes. It also makes us aware of work processes we need to add as well as those that are no longer necessary. The entire process is documented and transparent."

Hessen-Forst recently launched its next-generation GIS, ForstGIS\_NG. Because it too has been built on ArcGIS, staff can continue to use ArcGIS Workflow Manager. Hessen-

Forst has expanded its applications of GIS work processes to perform additional inventories, map storm damage, study forest conditions and surrounding infrastructure, identify suitable areas for industrial timber production, and more. GIS helps the enterprise's forest managers make informed decisions and meet goals for sustainable forest management.

Esri Deutschland GmbH and con terra developed FoBIS. Learn more by visiting the ArcGIS Workflow Manager page at [esri.com](http://esri.com) or contacting Martin Stöcker at [m.stoecker@conterra.de](mailto:m.stoecker@conterra.de), or visit [esri.com](http://esri.com) and search on *ArcGIS Workflow Manager*.



↑ ArcGIS Workflow Manager shows the necessary steps to manage the forest inventory including data management and update.

# Esri Meeting Gives GIS Users New Ideas and Networking Opportunities

By Steve Wilent, Editor, *The Forestry Source*

Approximately 150 forestry professionals from around the world descended on Redlands, California, to attend the second annual Esri Forestry GIS Conference. The gathering, which took place May 1–3, 2012, offered presentations by Ray Risco, president of Weyerhaeuser Solutions Inc., and Joseph K. Berry, principal of Berry & Associates Spatial Information

Systems and a leading educator in the application of GIS technology. Foresters presented forestry applications that showed how they have used GIS to address fire risk in Texas, cable logging in New Zealand, and more.

Among the presenters at this year's conference was Society of American Foresters (SAF) executive vice president and chief



↑ Forestry inventory skills are taught in the woods using ArcGIS on a tablet.



↑ Everyone participated in hands-on learning at the Esri Forestry GIS Conference.

executive officer Michael Goergen, who spoke to attendees about the natural resources professionals the society represents, SAF's efforts to promote forestry and its benefits in the twenty-first century, and the role GIS technology can play in helping SAF achieve that objective.

"At its core, SAF is about providing excellence in forest management, and as the field evolves, we're continually working to be as professional and responsive as possible," said Goergen. He explained that the world is changing rapidly, and SAF needs to be nimble enough to keep pace with it and perform at the highest levels. Combining that clarity of vision with the latest technologies will enable organizations to advance the practice of forestry for years to come.

Goergen closed his remarks with an invitation to members of the user group to join SAF and lend their technological skills and expertise to the society's efforts. According to Mark Books, GIS forester at Fort A. P. Hill and president of the Esri Forestry Group, the aim of the conference was to get forestry GIS professionals in the same room to connect with one another and share ideas.

"The idea of the user group is to develop a one-stop shop for all things forestry and GIS. So this conference is different from Esri user conferences in that it is organized by this community, for this community," said Books. "It provides us with an opportunity to get together with peers to exchange stories and hash out solutions."

Although similar in intent and style to last year's gathering, Books explained that the 2012 conference was more focused on user

## Forest Cover Evaluation Tool

The InFOREST application is used to evaluate how forest cover impacts water and air quality and show the effects of changing land use on particular tracts of forest or farmland in Virginia. Users can do basic mapping and view various layers. These layers include aerial imagery, topography, streets and roads, watershed boundaries, and forest conservation value.

Users can estimate various ecosystem services, such as carbon sequestration from forests and nutrient and sediment runoff from various land covers. InFOREST was developed for the Virginia Department of Forestry in partnership with Virginia Tech and the Department of Game and Inland Fisheries with funding from Dominion Virginia Power and a US Forest Service grant.

Learn more about InFOREST and use the program at [inforest.frec.vt.edu](http://inforest.frec.vt.edu).



↑ A conference workshop trainer teaches how to measure a tree using a laser measurement.

needs—a direct result of users' participation in the planning committee.

Based on the feedback he receives, Books noted that other members of the user group are just as appreciative, both for those new insights and ideas and for the general sense of camaraderie the conference provides. "From what I hear, people are glad that they came. Again, people are coming at this from [different] perspectives, and some people need to know nuts and bolts and some people need to see the bigger picture. They all came away with what they needed," Books concluded. "There is no substitute for having three days to talk shop with natural resources professionals, who work with GIS."

For more information, contact Mark Books, CF, Esri Forestry Group president, at [mark.a.books.ctr@mail.mil](mailto:mark.a.books.ctr@mail.mil).

This article was published in *The Forestry Source* magazine, June 2012.

## Esri Career Opportunities

- **Account Executive—Forestry**—Leverage your industry experience to help deliver geospatial solutions that meet business objectives. Use your understanding of the forestry market to sell strategic enterprise solutions to forest and land management organizations.
- **Agriculture Industry Solutions Manager**—Provide coordination and management for marketing and solutions development efforts for GIS products and services for agriculture. Assess and identify practical applications of GIS for agriculture.
- **Consultant/Project Manager—Natural Resources/Environmental**—Use your consulting and project management experience to help clients transform real-world needs into state-of-the-art, GIS technology-driven solutions. Lead project teams and manage the entire GIS implementation process.

To learn more and apply, go to [esri.com/careers](http://esri.com/careers) and use the Job Search tool.

## Tropical Forest Dataset Available on ArcGIS Online

Woods Hole Research Center (WHRC) is using Esri's ArcGIS Online to make its new carbon stock datasets available. Scientists and decision makers from around the world can now access this data and use GIS to study tropical forest carbon density and change, which impacts the atmosphere and affects climate change. Data consumers can access the dataset at [arcgis.com](http://arcgis.com).

## Save the Date

National Association of State Foresters  
September 17–21, 2012  
Cheyenne, Wyoming, USA  
[stateforesters.org](http://stateforesters.org)

Forest Technology User Conference 2012  
October 16–18, 2012  
Greenville, Florida, USA  
<http://thinkf4.com/articles/events/forest-technology-users-conference-2012>

Society of American Foresters National Convention  
October 24–28, 2012  
Spokane, Washington, USA  
[www.safnet.org/natcon12](http://www.safnet.org/natcon12)

Conference of the Parties (COP) 18  
November 26–December 7, 2012  
Doha, Qatar  
[forestsclimatechange.org](http://forestsclimatechange.org)

5th International Fire Ecology and Management Congress  
December 3–7, 2012  
Portland, Oregon, USA  
<http://afefirecongress.org>

Esri Forestry GIS Conference  
May 14–16, 2013  
Redlands, California, USA  
[esri.com/events/forestry](http://esri.com/events/forestry)

Esri International User Conference  
July 8–12, 2013  
San Diego, California, USA  
[esri.com/uc](http://esri.com/uc)

# Cable Harvest Planning System Improves Accuracy

By Barbara Shields, Esri Writer

To create a cable timber harvest plan, the planner needs to determine the timber payload that can be pulled to the hauler at different harvest locations. This requires analyzing a location's topography and creating hauling profiles that radiate out from the intended hauler's location. By including in the calculation both the terrain and the hauler's attributes, such as rigging capacity and harvesting method, one can determine where haulers need to be positioned to harvest with the greatest efficiency.

The New Zealand Research Institute (Scion) and Geographic Business Solutions (GBS) worked together to develop the Cable Harvest Planning System (CHPS). CHPS is an extension for ArcGIS software from Esri for payload analysis. It creates multiple profiles for potential hauler locations and reveals likely problem areas for the planner to consider when designing cable configurations.

CHPS supports cost analysis and decision making. By using high-resolution terrain data

and accurate profile analyses, planners can determine optimum landing locations.

Engineers use GIS to deploy harvesting equipment to areas most suited to a particular configuration. Conversely, they can use it to assess an area and determine which hauler and rigging configurations are most suited to a particular site. By doing this, the harvest planner improves harvest productivity and reduces risk for forest managers and harvesting contractors.

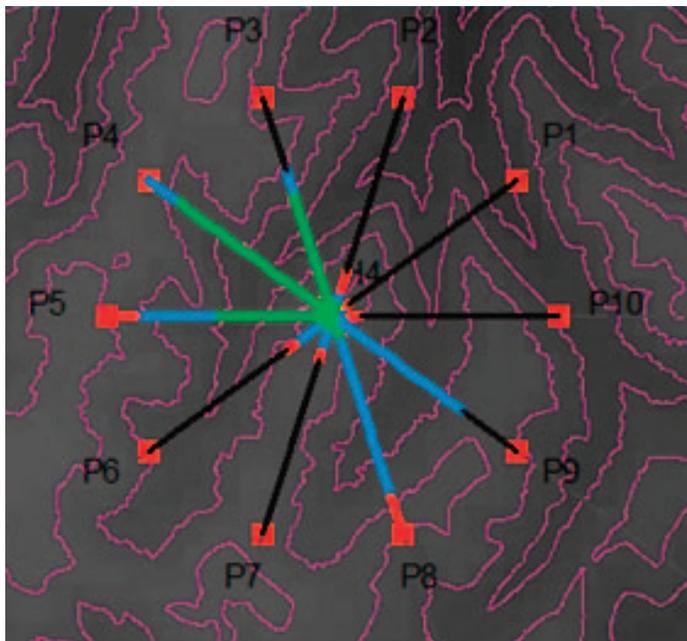
Popular search engines and drafting and mapping systems store maps and pictures and produce good graphic output. GIS-based solutions are different. Harvest planners, engineers, managers, and others, use GIS to link data with geography and geographic analysis. For example, the polygon that represents a forest on a map does not tell the user much about the forest except its location. To find out who owns the forest, the tree species it contains, the health of the forest, and what logging activities are planned, the GIS user

queries the data, and the software generates a view and may perform additional calculations. The person can also employ GIS to see relationships, and model the data for rich analysis such as determining an optimal cable harvest configuration.

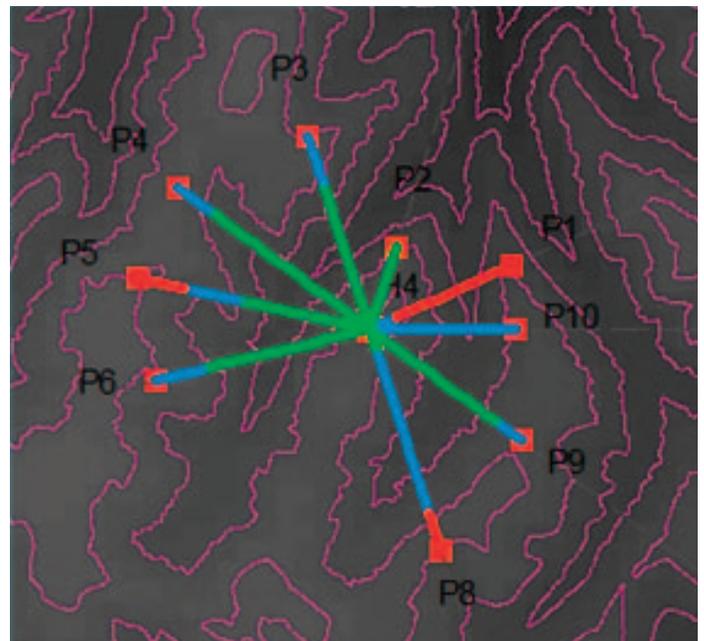
## System Workflow

The harvest planner begins the analysis by defining likely hauler landing placements in the GIS. He or she must also define tailhold locations; Tailhold locations can be manually added on a point-by-point basis, or CHPS can automatically create a wagon-wheel arrangement of cable profiles, with tailholds placed at user-defined spacing and distance from the landing (see figure 1). Tailhold locations can subsequently be shifted by the user to the most appropriate location (see figure 2).

Next, the user selects a harvesting system such as a standing, live, or running skyline. The user defines parameters relating to the hauler, cable, and carriage such as the tower



↑ Figure 1. Tailholds are automatically placed 300 meters (985 feet) from the hauler and 36 degrees apart.



↑ Figure 2. This is the same hauler location, with tailholds manually shifted or removed.

height, cable weight, and drum diameter. Information on equipment specifications is provided in default libraries.

For every tailhold location, CHPS then determines the terrain points from the contours or a digital elevation model (DEM) and calculates the deflection and maximum payload possible at each point. Based on the user's selection of system and profile parameters, CHPS calculates the rigging length that will be needed.

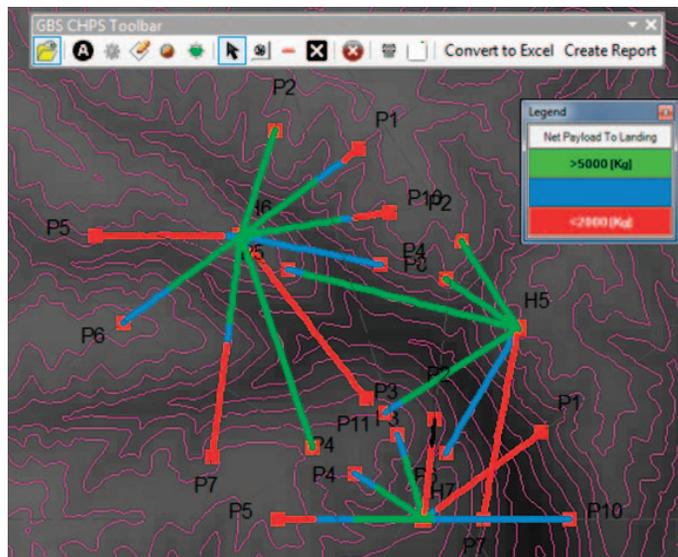
The harvest planner can look at environmental constraints by accessing the company's geodatabase for sensitive land features such as waterways or riparian buffer zones. These constraints are used to create simulations of a full suspension of hauler payloads over these areas.

Specific outputs from the system include harvest maps, profile charts and tables, haul distance computations, and rigging length requirement reports.

Harvest maps (figure 3) show the location of each hauler, associated tailholds, and the cables joining these to indicate where payload calculations have been computed.

Profile analysis charts (figure 4) and tables show the basic shape of the terrain, including points that limit cable deflection and, hence, payload. Identifying these points allows the harvest planner to modify the hauler location to avoid problem areas and improve the outcome. A chart shows the maximum payload possible from each terrain point to the hauler, which is an indicator of the productivity of the setting. This information is also provided in tabular form.

Average and maximum haul distances are calculated including slope adjustments that are based on terrain profiles. When these distance factors are included in the cost model, the cable harvesting operation plan is more accurate. Finally, a rigging report lists the length requirements for the skyline, mainline, and tailrope (haulback) based on user-defined inputs as well as slope-adjusted terrain distances. These reports ensure that harvesting contractors have adequate lengths of cable to log the entire setting.

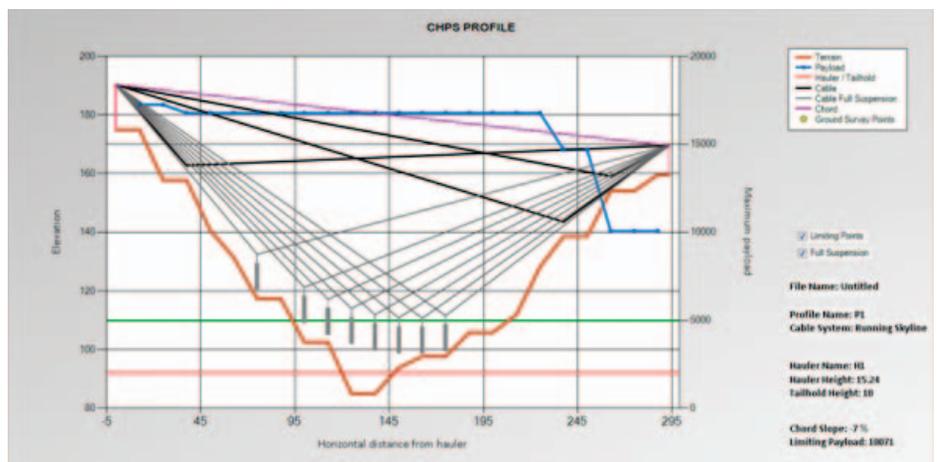


← Figure 3. This basic harvest map shows three different landing location options for selecting a feasible setup for a cable extraction of a steep gully setting.

CHPS is a flexible tool that provides basic profiles and supports detailed payload analysis. Users can focus on specific concerns such as highlighting the limiting terrain points on the most critical profiles. CHPS also integrates with Esri's ArcGIS 3D Analyst to produce 3D images or video fly-throughs for a better view of difficult terrain.

Because CHPS is an ArcGIS extension, there is no disconnect between the analysis and the underlying data such as contours in a digital terrain model (DTM). Ergo, there is no transaction cost for shifting large datasets between disconnected systems.

Find out more about CHPS by contacting Harley Prowse, GBS director, at [info@gbs.co.nz](mailto:info@gbs.co.nz) or +64-9-570-3875. Visit the GBS website at [gbs.co.nz](http://gbs.co.nz).



↑ Figure 4. Continued CHPS profile chart shows terrain profile, chord, and cable stylizations for limiting terrain points (black lines).



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