

## Acquiring and Testing Multiband Orthophotography (and integrated LiDAR) for Production of Enhanced Forest Inventories in the Great Lakes St. Lawrence Forest

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The Forestry Research Partnership was awarded eight project specific grants by the Enhanced Forest Productivity Science Program, including funding for the investigation of high resolution digital imagery and integrated airborne LiDAR (light detection and ranging) leading to the production of enhanced forest inventories in the Great Lakes St. Lawrence Forest Region. Murray Woods of the Ontario Ministry of Natural Resources Southern Science and Information Section and John Pineau of the Canadian Ecology Centre – Forestry Research Partnership are co-leaders of the project team that includes partners from Tembec, the Canadian Forest Service, the Ontario Ministry of Natural Resources, and Queens University. The project is directly connected to and integrated with research and development work already underway in northeastern Ontario led by Ken Durst and Kevin DelGuidice of Tembec; which is investigating similar technology and methods for the boreal forest region.

“Sustainable management of Ontario’s natural resources must be based on an accurate forest inventory,” said Mr. Woods. “This data layer is fundamental to all decisions

made about forest management, habitat science, areas of concern planning, and land use planning. Many sophisticated models are employed to aid resource managers in developing and supporting appropriate decisions that ensure sustainability.”

Traditional methods of developing a Forest Resource Inventory have involved a three-year process where black and white imagery is acquired, ground sampled and interpreted, and then automated to produce a digital/computer database. However, technology has reached the point where cost-effective alternatives to these current forest inventory approaches are now possible and many enhancements to both the creation and content of traditional inventory are feasible. High resolution digital imagery and multi-return LiDAR offers an opportunity to capture not only excellent colour and near-infrared photography of the forest, but dense point clouds of data in three-dimensional space that leads to the mapping of the forest canopy, the bare earth, and potentially many of the structural characteristics of individual trees such as height, diameter and volume – attributes desirable in a state of the

art forest inventory.

The Enhanced Inventory Project will test and evaluate this new technology in the production of a 21st century forest inventory; an inventory capable of supporting the sustainability questions that forest managers deal with each and every day when planning and implementing forest management practices. Several areas in and around the Nipissing Forest will be part of the study, including the forests of Samuel de Champlain Provincial Park for educational purposes. Long term spin-off benefits would include significantly improved forest management planning, modeling, operations, silviculture, road building, forest values identification, wetlands evaluation, ecological land classification, carbon cycling.

“This project will potentially help us to improve the current state of forest inventory data across the central and southern portion of Ontario on all forest management units and sustainable forest licenses,” said Mr. Woods. “It will also be very valuable to forest companies and the ministry with day to day operations.”



Dave Nesbitt (MNR) uses his GPS to reference some extra Ground Control Points in Phelps Township.



Paul Courville (FRP) and John Wright (CEC) go for the Wow factor as they demonstrate some of the capabilities of LiDAR using 3D glasses.



Murray Woods (MNR) gives Paul Courville (FRP) an introduction to the project.

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**Coming Soon:**

Enhanced Forest Inventory Project Website

**“This project will potentially help us to improve the current state of forest inventory data across the central and southern portion of Ontario on all forest management units and sustainable forest licenses.”**

Murray Woods  
 Senior Analyst - Forested Landscapes  
 Ontario Ministry of Natural Resources

**PROJECT TEAM**

**Forestry Research Partnership**  
 John Pineau  
 Paul Courville  
**Ministry of Natural Resources**  
 Murray Woods  
 Silvia Strobl  
 Paul Sampson  
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 Kent Todd  
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**Algonquin Forest Authority**  
 Gord Cumming  
**Ottawa Valley Forestry Inc.**  
 Jeff Leavy  
**Queen's University**  
 Paul Treitz  
**Tembec**  
 Ken Durst

**PROJECT SCOPE**

As word of the project spread this spring and early summer, several parties interested in the technology approached the project team. Ontario Parks originally requested that Kawartha Highlands Provincial Park be flown as part of the project, and offered cash leverage to cover the cost. However this was quickly augmented to include the entire park watershed, offering additional research evaluation potential for the resulting data. The Kawartha Highlands Park watershed encompasses an area of over

80 000 hectares! There is great interest in determining how high resolution digital imagery and LiDAR technology will delineate and predict wetland characteristics. By using the entire watershed there will potentially be enough data diversity to make accurate assumptions in wetlands. It is also hoped that new insights will be possible in terms of what the data can provide versus other technologies for delineating, studying and managing watersheds and wetlands.

In total 145 100 hectares of forest in central and southern Ontario are being flown. This will provide forest inventory interpreters with a comprehensive and wide variety of Great Lakes St. Lawrence forest types. M7-Visual Intelligence (M7VI) of Texas has been contracted to carry out the collection of data for the project.  
[www.visidata.com](http://www.visidata.com)

See Map on Page 3 for more detail.

**FIELD WORK**

Under the direction of Dr. Paul Treitz, PhD candidate Neal Pilger, and with help from Dr. Darwin Burgess of the Canadian Forest Service, field crews from Queens University have collected data on a number of existing research plots within the Petawawa Research Forest (PRF). As a part of his dissertation, Neal Pilger is attempting to use small area LiDAR in the evaluation and monitoring of above-ground carbon and biomass.\* In addition,

Blair Kelly will also be collecting ground data in the PRF for the project.

Dr. Bill Cole of the Ontario Ministry of Natural Resources, Ontario Forest Research Institute has also had a number of crews collecting data at the Swan Lake Research Area in Algonquin Provincial Park in advance of the flights by M7VI. Forest Resource Inventory staff have also carried out ground sampling in Swan Lake to help develop the inter-

pretation of high resolution imagery.

All plot data collected will be critical for both inventory interpreters and project researchers for correlating forest types accurately and efficiently to the imagery and LiDAR data, and ultimately for evaluation purposes.

\*See: [http://geog.queensu.ca/Student\(individualpages\)/Pilger.htm](http://geog.queensu.ca/Student(individualpages)/Pilger.htm)

**BREAKING NEWS**

After several conference calls between the project team and M7 Visual Intelligence, planned flights in the Great Lakes St. Lawrence forest began during the week of August 29th, 2005. It is estimated that it will take two days to complete all flights,

depending on weather. The Project Team has provided M7VI with preferred priority areas. As well, specific plots within the Swan Lake Research Area and the Petawawa Research Forest will be flown with multiple passes for higher resolution LiDAR.

A technical workshop focusing on interpretation methodologies for enhanced forest inventory is being planned for October, 2005 in Sault Ste. Marie.



# Image and LiDAR Aquisition Areas August/September 2005

