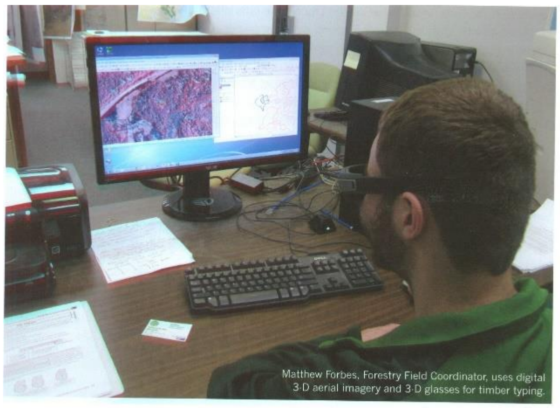
WOODWORKS

News from Tolko Manitoba Woodlands 2015

Digital 3-D Aerial Imagery Simplifies Harvest Planning

By Matthew Forbes, Forestry Field Coordinator


Matthew Forbes, Forestry Field Coordinator, uses digital 3-D aerial imagery and 3-D glasses for timber typing.

New technology is giving planners close-up and personal aerial views of forested areas and making their jobs much eaiser.

Aerial imagery allows forest planners to identify land features that might influence forest operability. The bird's-eye view enables them to pinpoint wildlife and other envirnomemtal concerns, as well as recreational, Aboriginal or other group interests.

Planners use the imagery to outline areas of viable timber into blocks for easier harvest, and to determine the best location for roads and waterway crossings. The harvest blocks are split into different timber types so that more accurate data can be collected during the pre-harvest survey, enabling better volume calcualtion.

In the past, planners used actual aerial photos. Sometimes they required multiple sets of them, scaled at either one inch to a quarter mile or one cm to 150 metres. Once they identified harvestable locations and timber types on the photos, they used a dot grid to calculate the areas and determine the number of survey plots.

Then they'd scan the photos, match land features in the ESRI ArcMap/Google Earth (GIS software program), draw the survey plots on the GIS, and upload it to GPS for file location.

Now, using the Summit Evolution Lite 3-D imagery program, planners upload the aerial imagery they want to work with, don 3-D glasses, interpret the 3-D images and outline the block and strata on the screen. The technology allows them to interpret features in more detail than air photos do.

Features created in Summit Evolution are copied to ArcMap, and area is calculted automatically.

The new system saves set-up time for large areas that would have required many physical photos, enables more detailed and accurate block craetion, and saves space as the planners nor longer need a wall of filing cabinets to hold photos of a licencse areas. Digital 3-D imagery is cutting edge technology- an innovation that allows us to improve our planning process.

Use of Infrared for Detection of Bat Caves

(Excerpts from Taiga Air Services report)

In December 2014, Tolko in cooperation with Manitoba Conservation and Water Stewardship (CONSW) conducted a helicopter mounted aerial infra-red survey to test the IR equipment's success in locating locate bat hibernacula (caves with overwintering bats).

Tolko staff did initial ground surveys in some areas before IR scanning flights were done.

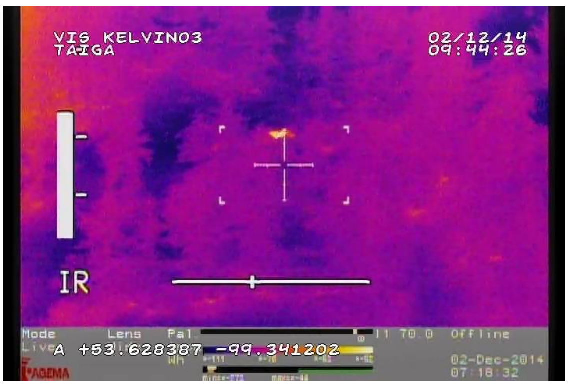
Taiga Air Services Ltd was tasked with conducting Infrared Surveys of known bat-cave locations in the Grand Rapids (Karst ASI) area, as well as a trial survey along a potential forestry road alignment to determine the effectiveness of infrared in detecting occupied bat caves.

The survey was conducted on December 2nd, 2014. The temperature at the start of the survey was -29C increasing to -18C by noon. Winds were light out of the southwest at 6km/hr., creating a wind-chill close to -35C at the start of the survey and diminishing to -25C by noon. All areas were covered with a continuous layer of snow, accumulation at the Grand Rapids airport was approximately 15cm.

Of the 7 known bat cave locations that were flown, 6 were readily detectable with the infrared camera as well as visually identified. The identified caves showed up with fairly significant contrast from the surrounding terrain, at ranges of up to 300m depending on the type of cave opening and its relative orientation to the infrared camera. Scanning was conducted between 60 and 135m above ground level (AGL).

Cave in centre beneath the poplar tree

Road Alignment Survey



Heat signature- of cave with bats at top of cross

At that altitude most of the caves showed a thermal gradient surrounding the opening which exceeded the size of the visible opening, which would suggest substantial heat generation within the caves. As a result, the relative temperatures of the cave openings were estimated to be 20C warmer than the surrounding terrain. In the vicinity of some caves, small areas of increased temperature were also noticed near the cave openings, which likely correspond to small vents or spots where there is only a thin layer of rock between the cavern and the surface.

When flying the road alignment (approximately 115m AGL) a location was identified as having a similar heat signature to the previously detected caves. A high resolution image of the location appears to show an opening to a cavern. The average speed along Right of Way survey was 63 KPH. Later, back in the office, when this location was compared with the results of the ground survey it confirmed the presence of an opening that the ground team had marked as a possible cave entrance.

The infrared camera was able to detect a noticeable heat signature from the bat caves, in some cases from a fair distance away. Due to the nature of infrared radiation, the camera itself is unable to distinguish what is creating the heat, it only sees the effects that a heat source is having either directly on the camera, or indirectly on the environment around the source. To be able to differentiate between a potential bat-cave and where an animal may have recently been bedded down requires a visual inspection of the location to reduce the potential for a false-positive indication; given the bat caves are maintaining an internal temperature of 5-10C and that other wildlife that remains active over the winter may have surface temperatures exceeding 5-10C. A visual inspection should be carried out immediately after detection of a heat source for verification. Similarly, locations which have been previously identified as caves with potential bat colonies could be inspected with infrared fairly quickly to determine which locations may require a more in-depth evaluation by ground crews.
The size and intensity of the thermal ‘target’ of the caves plays a factor in the ease of detection. More pronounced heat signatures make them more readily identified and less likely to be confused with wildlife or terrain features that are affected by daytime heating.

Careers in Forest Operations

Heavy Equipment Operation; Harvesting

Delimber Operator:
Operates a "delimber" machine, which parks at a roadside landing to take piles of whole trees, and grabs each tree to cut & delimb it into desired log lengths. The delimber operator runs a purpose-built, tracked machine with a long boom arm and log bucking device, which is a self-propelled vehicle that grabs whole trees, delimbs the tree, and then piles logs to await slashing. The delimber machine can process a whole tree in a single motion, while parked at a roadside "landing" area. The operator safely maneuvers the machine from within an enclosed cab, on forest roads and log landing areas, to skillfully delimb, and, pile logs at the roadside. Controls machine operation seated inside the machine's cab, using a combination of joysticks, buttons, pedals and levers. Operator drives a company pickup to the forest job sites; and often works independently, following detailed work plans and specifications. Communicates safe machine and log movement activities using a radio. Operator may be responsible for machine basic service, refueling, diagnostics and minor repairs. Requires special safety gear, climbing off & onto the delimber, and some walking on sloping forest terrain.

Prior Experience: Work as log loader operator, or operator of other forestry equipment; preferred previous experience operating farm machinery or heavy equipment; learn from work with experienced delimber operator; demonstrated safe delimber & service performance; written delimber operator handbooks and machine service training guides; on-the-job-training.

Slasher Operator:
Operates a "slasher", which moves through the forest to buck and pile. The slash machine operator runs a purpose-built, wheeled machine with a long boom arm and hydraulic grapple, which is a self-propelled, off-road vehicle that maneuvers through the forest to accomplish its work. There are several types of slasher that move about the forest, including machines that pile, and other machines that grind-up slash. One slasher and its long boom gathers and grabs the delimbed logs, picks it up, and then in a single motion places logs onto a deck with a saw that cuts to prescribed length and then places logs in desired location/pile. The operator safely maneuvers the machine from within an enclosed cab, on slight to moderate forest slopes & occasionally on rough terrain to skillfully lift & swing logs toward the roadside. Controls machine operation seated inside the machine's cab, using a combination of joysticks, buttons, pedals and levers. Operator drives a company pickup to the forest job sites; and often works independently, following detailed work plans and specifications. Communicates safe machine and log movement activities using a radio. Operator may be responsible for machine basic service, refueling, diagnostics and minor repairs. Requires special safety gear, climbing off & onto the delimber, and some walking on sloping forest terrain.

Prior Experience: Work as choker setter and log loader operator; preferred previous experience operating other forestry equipment, farm machinery or heavy equipment; learn from work with experienced operator; demonstrated safe performance; written operator handbooks and machine service training guides; on-the-job-training.

Annual Allowable Cut (AAC) and Wood Supply Modeling

The Annual Allowable Cut, commonly referred to as the AAC, is the amount of wood permitted to be harvested in the Province (of Manitoba) within a one year period to ensure the sustainability and productivity of our forests.

Wood supply is the timber harvesting opportunities associated with a specific forest condition, management strategy and wood flow policy. Wood supply analysis (modeling) is an assessment of future timber supplies over long planning horizons (200 years) by using wood supply models. Wood supply model is an analytical model that simulates the harvest and growth of a collection of forest stands over time in accordance with stated objects, actions and constraints. (MC. 2006. *Wood Supply Report for Forest Management Licence #1*)AAC's are determined for each Forest Management Unit (FMUs) in the Province. The calculation of the AAC is very comprehensive, usually taking two years to complete in Manitoba. With the aid of computer models, sustainable AAC levels are determined and implemented. Only an AAC that is sustainable is acceptable.

In general, annual allowable cut is determined from knowing the amount of area that is of certain forest types (species composition and age) within a defined landbase, collecting information on these forest types' growth rate (annual increment), how long it takes the forest type to reach a certain size or volume (rotation age) and how long it takes the forest type to re-establish itself after harvest or fire (regeneration lag). Successful regeneration is assumed. Adjustments may be made to account for fire losses or waterway buffers by applying a % removal to the starting landbase.

AAC can be calculated on an area or volume basis. In Manitoba, AAC is calculated on a volume basis. So in simplified terms, the calculation proportions the volume (both the original volume and the volume accumulated over the rotation) over the rotation age. Conceptually on a volume basis, the allowable cut should not exceed the annual increment of the forest. This assumes that the original landbase is a "normal forest"; that is, all age classes are present is equal amounts and results in the AAC will be the same over the rotation period. If the original landbase is not a normal forest, then there will be times when the AAC is lower or higher than an AAC from a normal forest. For example, a very large fire on the landbase could result in years where no harvest can occur until that fire has reached rotation age. If this is the structure of the original landbase, the AAC is usually reduced so that harvest can continue over the "lean" years at a predictable level.

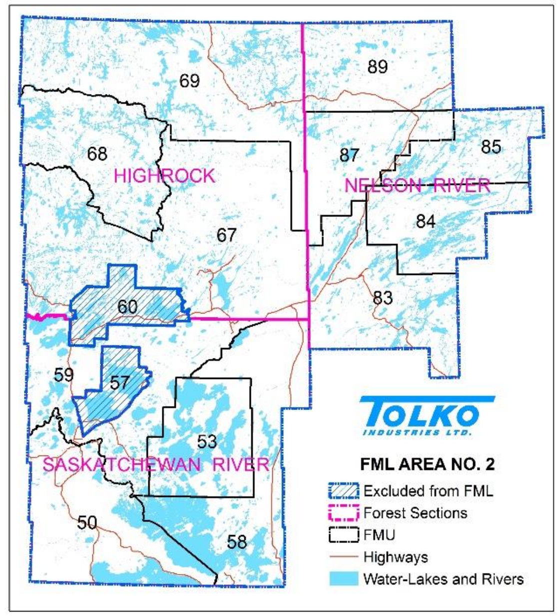


Figure 1 Forest Management Units for Tolko Forest Management Licence

With the advent of computers, more processing power and the need to consider other factors besides fibre production, the calculation of AAC has become more complex. The determination now takes a longer view than just the rotation period (75-100 years depending on the species) and is generally called Wood Supply Analysis or Modeling.

Wood supply is the quantity of timber available for harvest over time. Wood supply is dynamic, not only because trees naturally grow and die, but also because of the conditions that effect tree growth, and the environmental, social and economic factors that affect the availability of trees for harvest, change through time. In Manitoba, the government analyzes wood supply for 200 years.

Wood Supply Modeling (WSM) still starts with the landbase and knowing the area of forest types (Forest Inventory). Forest Inventory is a process in itself where aerial photography is interpreted, mapped and ground-truthed. The Manitoba government is in the process of updating all forest inventories to more current version. As an area (e.g. a Forest Section) is updated, WSM will be done.

Today, the Forest Inventory (or landbase) is stored digitally in a Geographic Information System (GIS) and includes not only the forest type information but also geographic information (e.g. roadways, lakes & streams and ownership (e.g. Parks), etc.). The implementation of the GIS allows for recalculation of the forest inventory from the date of origin (i.e. the date when aerial photography was taken) to include changes such as harvest and the assignment of forest type on regenerated stands from recent surveys. The GIS allows for specific buffers on lakes or streams rather applying a percentage to the landbase. For example, a buffer of 100 metres can be applied for any lake 20 hectares or greater in size.

New technologies and methods allow for more analysis accounting for

- Conversion of forest types- e.g. without intervention a proportion of softwood types may convert to mixedwood types- i.e. less softwood available for future harvest
- management strategies- e.g. even-flow of fibre, woodland caribou habitat management, landscape management
- operation strategies- different utilization standards; silvicultural treatments such as herbicide application, tree improvement programs
- policies such as harvest block adjacency rule

On Tolko's Forest Management Licence (FML) area has a completed WSM for the Saskatchewan River Forest Section (SRFS) and two FMUs in the High Rock Forest Section (HRFS). WSM has not been done for FMU 69 in the High Rock Forest Section as it is not economical to harvest at this time. These AACs came into effect for the 2015-2020 cut control period. The WSM was run for 6 different utilization standards; i.e. different top diameters and log lengths. Overall, the AAC resulting from the WSM (base case 10cm top and 8ft log length) is within 3.35% of the simplified AAC; the AAC for the SRFS increased by 3.43% and the HRFS decreased by 3.28. The reports for these WSM are not yet available on line.

So at present, Tolko's AAC for the Nelson River Forest Section is the only area determined on the "simplified" AAC calculation rather than WSM. Work on the Nelson River WSM is currently ongoing.

In Manitoba, AAC is managed through a cut control policy for a cut control period of five years. The cut control policy for FML areas (FMLA) states that the licensee may exceed the AAC in any given year provided that the simple average harvest volume for 5 years is no more 100% of the AAC for the 5 year period. Exceeding the AAC in one FMU by 10 % or less does not require prior approval but must be reported. Any expected harvest over 110% of the AAC in one year does require prior approval by MCWS. Normally, unused volumes cannot be carried forward to the next 5 year period. The current period is 2015-2020. Exemption to exceeding the 5 year harvest may occur if the Director of Forestry authorizes the FML holder to harvest an area negatively affected by fire, insect or disease. The Director may also authorize exceptions to this policy, such as carry-overs of unused volumes.

There is a separate cut control policy for quota holders that describes the cutting authority, entitlements, 5 year volume management and other requirements. The 5 year volume management for quota holders differs from FMLA in that the policy states that a quota holder may harvest all of the 5 year volume in one year with approval from Conservation & Water Stewardship (MCWS). The other difference is that the policy specifically states that unused volumes from the 2010-2015 cut control period, quota holders can carry forward one year's unused allocation from the 2010-2015 period to be harvest within the 2015-2020 period.

Want to find out more about what you've read in this newsletter? Contact Paul Chapman, Woodlands Manager, Forestry at (204) 623-8574