Development of a Forest Inventory for New Brunswick for the 21st Century

Part 1: Understanding what we did in the 20th century

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Introduction

• Forest inventory is an integral component to forest management planning
• Provides the foundation upon which most decisions are made
• Our ability to make sound decisions:
  – Sustainably
  – Economically
  – Politically

is contingent on having good information about a wide range of forest values
Introduction

• As we have already seen technologies we can use for Forest Inventory are changing
• As are the questions we are asking a forest inventory to answer
• As we move to a new era it is good to look back at what we’ve done in the past
  – Understand what worked
  – What didn’t
  – Where are the gaps
  – What are today’s needs
A history of forest inventory in NB

- **Report on New Brunswick Reconnaissance Work**
- **1913-15**
- **Author: R. B. Miller**
- Provides an overview of:
  - The Resource
  - Royalty/Stumpage
  - Operations
  - Utilization
A history of forest inventory in NB

• In 1945 the entire Province was flown at 1:15,840 (1”:1/4 mile)
• No inventory was produced at the time
• Some recent examples of using this dataset in retroactive studies
• Photos still available, negatives in Ottawa
INTRODUCTION

This is the first published report on what is the first forest inventory survey specifically designed to cover the entire province of New Brunswick. The survey was conducted by the Photogrammetry Branch of the Provincial Department of Lands and Mines, as part of a national forest inventory, under an agreement with the Government of Canada, whereby the costs of the project were shared by the two governments.

The purpose of the inventory is to supply forest resource data, of a regional nature, for the planning and policy making of both private and public agencies and for the information of the general public. The survey is not intended to supply data for use in detailed forest management planning on a local basis.

Work initially commenced in 1951 shortly after the establishment of the Federal-Provincial Forestry Agreements. However, the inventory staff of the Photogrammetry Branch was loaned to the Department of National Defence in August, 1952, for appraisal work in the Camp Gagetown area and progress on the provincial inventory ceased until early in the summer of 1954. Summary compilations for the province were not completed until early in 1958. The agreement provides for continuation of work to maintain and revise the inventory data.
A history of forest inventory in NB

- Inventory in 1968, no report produced
- 1979 inventory report
- 1:20,000 imagery flown 1974-77
- 1,600 field plots
- States that demand for wood fiber had increased by 32% between 1968 and 1974
A history of forest inventory in NB

- 1982 Crown Lands and Forest Act
- Province re-flown 1981-85 (1:12,500)
- Inventory report in 1986
- 2,413 PSP’s established
- 14,000 stands cruised (FDS)
A history of forest inventory in NB

• The “1980’s” inventory represents the modern era of forest inventory in NB
• Arc/Info acquired in 1981
• Spatial inventory
• Most of the process lives on today with tweaks and modifications

Computer-based mapping in forestry: a view from New Brunswick

Already generating widespread interest in the forestry community, the impact of GIS may well equal that of the Bitterlich point sampling method

By Thom Erdle and Glen Jordan

For many years, several regions of Canada, is in the midst of a major shift in emphasis, away from the controlled exploitation of the forest resource toward more intensive forest management. This, in turn, has generated interest in computer-based, information-handling techniques. In particular, there appears to be widespread interest in techniques of computer-based mapping and analysis of geographically referenced forest resource information—namely Geographic Information Systems (GIS). GIS technology has already been acquired by a number of forestry agencies including the British Columbia Ministry of Forests and MacMillan Bloedel Ltd. in the west, and the New Brunswick Department of Natural Resources and J.D. Irving Ltd. in the east. It is quite obvious that many other agencies are in serious pursuit of GIS technology, and still more are at least cautiously interested.

This paper is aimed at these latter two groups. Our purpose here is to draw on New Brunswick's GIS experience to shed some light on Geographic Information Systems so that potential users are somewhat better equipped to determine if and how GIS technology can assist them in their forest management activities.

To provide some insight into how GIS is used to manage forests, we will cover the following questions:

1. Why the sudden interest in GIS technology?
2. What is a GIS?
3. How is a GIS database built?
4. What can be done with a GIS database?
5. What is the New Brunswick experience?

Why the sudden interest in GIS technology?

Although research, development and limited application have been underway for more than ten years, it is only recently that GIS technology has generated widespread interest in the Canadian forestry community. Why? Some likely possibilities are:

1. Foresters, like most other professional groups and the public at large, are caught up in the ever-increasing momentum of the so-called computer revolution.
2. Recent advances in computer hardware and software have brought GIS technology to a state where it is both practical and economically appealing.
3. For many parts of Canada, there are predictions of future forest supply problems which can only be analyzed by more judicious management planning and implementation. This interrelated planning and action require more and better information, particularly with respect to the geographic distribution of the resource.
4. Negotiation through a tight wood supply future may force a retreat of the forest's behavior under a chosen regime and, from this, remedial action to keep the forest on the desired course. This necessitates monitoring the forest resource's status and updating it quickly and efficiently.

The latter three reasons are the most compelling and, together, forced much of New Brunswick's rationale for its GIS acquisition.

What is a GIS?

GIS technology has arisen from recent advances in mapping and data management techniques. Essentially, it is a hardware/software system specifically designed for storing, maintaining, analyzing and displaying geographically referenced data.

Forest resource data consists of two distinct types: spatial (or location) and descriptive (or attribute). Spatial data answers the question: where is it? Descriptive data answers the question: what is it? Both are essential in a forest management...
A history of forest inventory in NB

• Since 1982 we have completed 3 inventory cycles
• Using more or less the same design and technology
  – 1:12,500 analogue photography
  – Manual stand delineation and interpretation
  – Network of temporary sample plots (FDS)
  – Network of permanent sample plots (PSP)
• The most recent cycle (2003-2012) is wrapping up
• We are investigating options for the next cycle
Inventory objectives

• Objectives were defined for the 1982 inventory
  “The inventory is intended for use in planning and policy making by both public and private agencies, but must be supplemented for use in forest management operations as the estimates given are only valid for relatively large areas.”

• I don’t believe we have reviewed these objectives since

• Or how our current needs are addressed by the stated objectives

• Technological changes necessitate we do things differently
Inventory objectives

- Available Mature Volume
- Available “Managed” volume from planting/thinning
Inventory objectives

- Available Mature Volume
- Available “Managed” volume from planting/thinning
- Unavailable Volume Due to Conservation

Wood Volume

1982

2020

2060
Inventory objectives

- Available Mature Volume
- Available “Managed” volume from planting/thinning
- Unavailable Volume Due to Conservation
Inventory objectives

Available Mature Volume
Available “Managed” volume from planting/thinning
Unavailable Volume Due to Conservation

Wood Volume

1982
2020
2060
Today’s challenge

• We still need to answer strategic questions
• As well as address operational questions
  – Where are the early CT opportunities?
  – Which stands fall under non-CC policies?
  – Which how do I minimize/flow the amount of pulp harvested?
• The trees are only part of the equation:
  – Site mapping
  – Hydrology
  – Road construction / maintenance
  – Wood cost
Today’s challenge

Economic realities:

• Inventory will always represent a cost
• We will need to demonstrate that:
  – Increases our understanding of the resource
  – Enhances timely decision making
  – Increases the value of the resource
  – Minimizes wood cost
Today’s challenge

Example 1:
• For every $100 spent on inventory, an additional $25 are spent on supplemental inventory activities
  – Could the supplemental activities be carried out more efficiently, timely and at lower cost up front?

Example 2:
• Every 1% increase in inventory error results in $100,000 in additional downstream costs or lost revenue
  – How much does it cost to reduce error by 1%?
  – Cost-plus-loss analysis
Today’s challenge

• LiDAR looks promising and will hopefully have a role to play
• Stands are an artificial or at least subjective construct
• We need to know how variation occurs within stands
• And quickly be able to reconfigure operational units according to needs
30 years of FDS
30 years of FDS
30 years of FDS
Future field inventory

- Assuming LiDAR has a role to play in future cycles:
  - Ground plots will play a role to calibrate predictive models
  - Still required to initialize growth and yield models
  - PSP dataset still required to calibrate these models
  - Can we better configure plots to maximize their value?
- To answer today’s questions?
- To capture change over time?
Future field inventory

• I think there are opportunities to consolidate the PSP and FDS program
• Put both programs on a common plot network
• Systematically lay out plots
• Revisit the same plots on a cycle
• Do not protect plots from the activities we carry out in the forest
Future field inventory

• These changes will result in efficiencies, reduced duplication and more value from the money we invest in field inventory

• The more we commit to a plots location the easier it is to justify collecting wider set of attributes
  – Site
  – Map tree locations
  – Non-forest values

• And understand how they change over:
  – Time
  – Management regimes