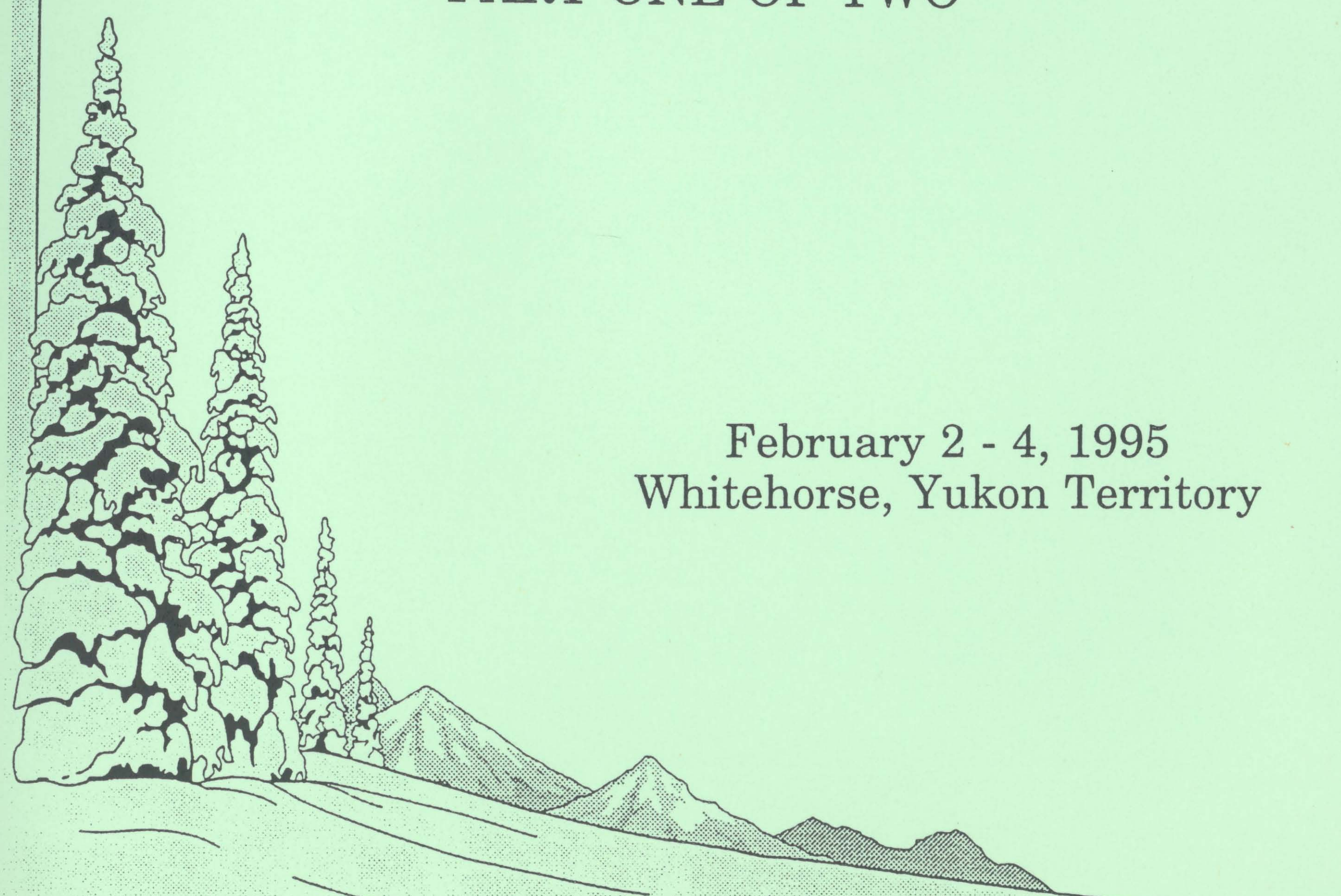
SYMPOSIUM PROCEEDINGS

YUKON FORESTS: A SUSTAINABLE RESOURCE

PART ONE OF TWO



February 2 - 4, 1995
Whitehorse, Yukon Territory

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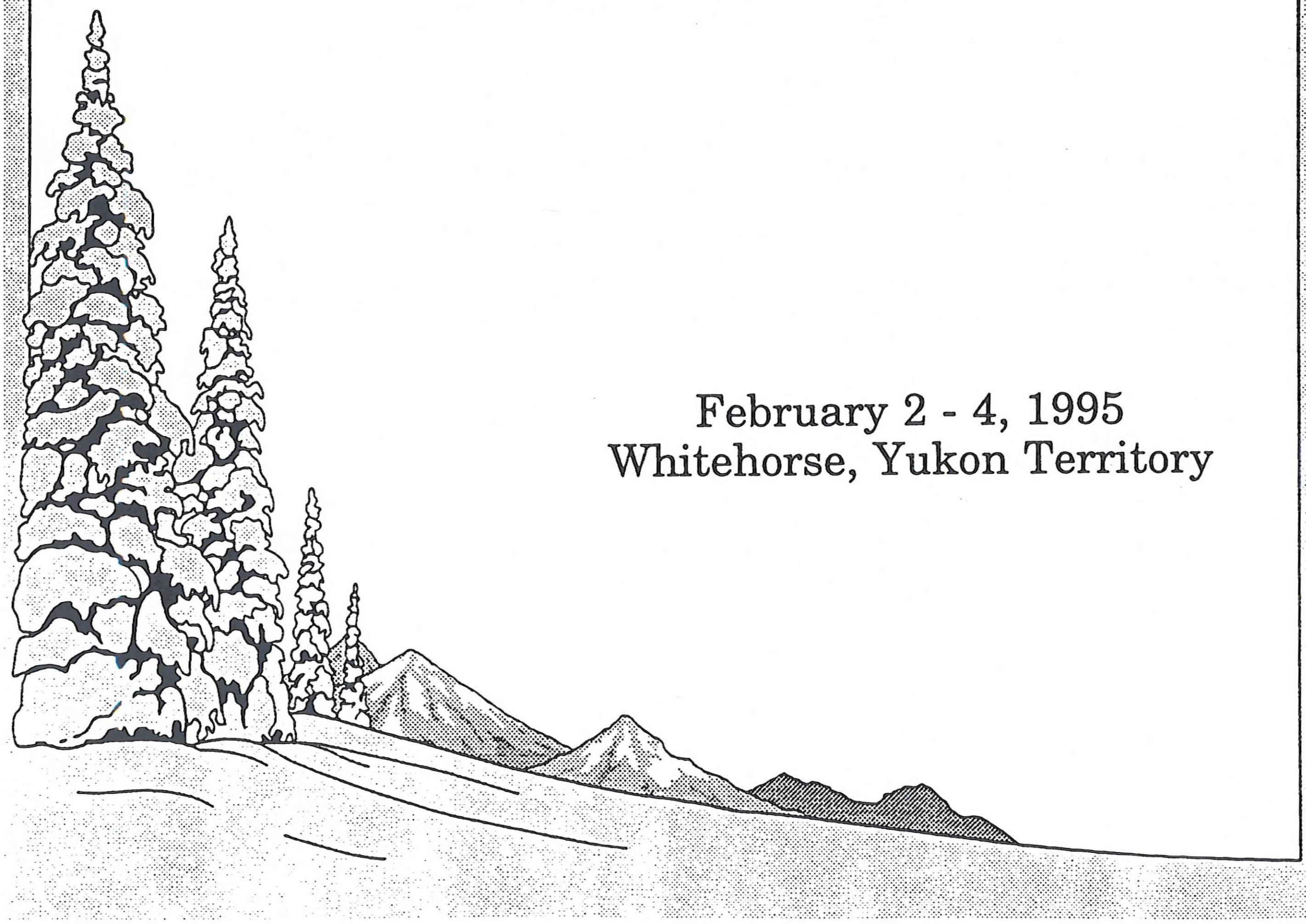

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this symposium.

PREFACE

The first symposium ever held in the Yukon on the boreal forest took place at the Westmark Whitehorse Hotel in Whitehorse, Yukon Territory, on February 2nd, 3rd, and 4th, 1995. The symposium was convened under the auspices of Yukon College with support from the Canada/Yukon Cooperative Agreement on Forestry Development.

The papers included in these symposium proceedings provide immediately useful information and sparked animated discussion following presentation by their authors. The opening two papers by Don White and Kathy Bisset, respectively, provide first; a perspective on the state and quality of the Yukon's forest, the legislation governing its use, and the status of the Forest Management Section which administers the legislation and forest use; secondly, a history of logging in the Territory which took up from the Klondike Gold Rush through the economic expansion period into the modern period.

Against this background, Dr. Gordon Weetman discussed Integrated Resource Management and Ecosystem Management in the context of the Yukon landscape. He suggested policies and legislation in the Yukon should not repeat fundamental errors in forest policy exemplified in other jurisdictions. Scott Smith and David Murray provided information on Yukon soils and climate and their implications for sustainability of boreal forest ecosystems. The biodiversity of these ecosystems was presented by Valerie Loewen, Wendy Nixon, and Pam Sinclair, stressing the need for increased understanding of habitat use by wildlife and of effects of forestry on wildlife. Garry Merkel helped tie this together by discussing the way in which the whole community could be involved in land management.

The current status of the Yukon forest industry was the subject of Harry Holmquist's presentation, which also touched on the impacts of the existing forest policy voids. Bill Klassen's paper on ROTT (Resources Other Than Timber) identified the range of forest resources relied on by Yukoners for their quality of life. The recent Alberta Experience in balancing economic development, social considerations, and conservation values in its boreal forest was presented by Dr. Ken Higginbotham.

"Chaos theory in action" was Dr. Ed Packee's opening description of the ecology of northern forests. Emphasizing that there was not steady state he discussed the need to manage the various agents of disturbance essential to maintaining ecosystem health. Dr. John Zasada discussed the structure, function, and process of silvicultural options for the management of boreal forests. Peter Henry described the process currently underway in the Yukon to develop a common ecosystem classification and Cliff Kowalsky demonstrated how ecological associations were applied in operational forest management. The biology and management of one of the more challenging agents of disturbance, the spruce beetle, was discussed by Robert Hodgkinson in the final paper presented at the symposium using the example of the recent outbreak of the beetle in the Kluane area.

These papers contribute to the base of information from which to develop policies and legislation for managing the Yukon forest under existing legislation. Symposium participants and organizers are considering a further conference to focus on concerns raised in these papers and during the question and answer periods.

Bill Klassen

STATE OF YUKON'S FORESTS

by

Don White
Forest Management Technician
Forest Resources

Introduction

Large-scale commercial harvesting of Yukon's forests began with the Klondike Gold Rush of 1898 and continues today with the Yukon Timber Rush of 1994.

Today I will be giving an overview of the development of forest legislation in Yukon, growth of the Forest Management Section of the Northern Affairs Program and development and progress of the forest inventory. I will touch on some of the work done over the past few years under the Canada Yukon Cooperative Agreement: Forestry Development.

I will conclude by suggesting directions the section may take in the future.

I will not discuss devolution and I will not discuss the shortcomings of existing legislation, fees or policy.

Development of Forest Legislation

Some think that we are at the dawn of a new era in the utilization of our natural resources in Yukon. Some want us to be more holistic in our approach to natural resource management. Some believe they have managed Yukon's natural resources well. Others, on the other hand, believe that Yukon's natural resources have managed its human population. The Yukon Conservation Society doesn't believe that anyone has managed any of Yukon's natural resources well -- at all -- ever!

Forestry has been through almost 100 years of evolution in Yukon. In 1896 a Yukon First Nation member and a Euro-American found gold in Rabbit Creek. In 1897, a ton of gold arrived in Seattle, Washington to announce that discovery to the world and kicked off the Klondike Gold Rush that happened in 1898.

At that time, Mining Recorders in Yukon were responsible for issuing timber permits and timber berths and keeping records on volumes to be harvested and fees received. In 1898, there was a $5.00 permit fee charged to all commercial timber permits issued.

The *Territorial Lands Act* (R.S., c. T-6, s. 1.) is the governing legislation under which Forest Resources operates. Sections 17 and 18 of the Act set out the broad limits of our activity. They read as follows:

TIMBER

> 17. No person shall cut timber on territorial lands unless that person is the holder of a permit. R.S., c. T-6, s. 13.
>
> 18. (1) The Governor in Council may make regulations:
>
> (a) respecting the issue of permits to cut timber and prescribing the terms and conditions thereof, including the payment of ground rent, and exempting any person or class of persons from the provisions of section 17;

(b) providing for the suspension or cancellation of permits for contravention of any of the terms or conditions thereof or for contravention of any provision of this Act or the regulations;

(c) prescribing fees for the issue of permits and prescribing the dues to be paid in respect of timber cut pursuant to a permit;

(d) providing for the making of returns by holders of permits;

(e) providing for the recovery of dues, including the taking of security therefor, and the seizure, forfeiture and sale of timber; and

(f) providing for the seizure, forfeiture and sale of timber unlawfully cut on territorial lands.

(2) For the purposes of subsection (1), "dues" means all ground rents, royalties, duties, fees, rates, charges or other moneys payable by any person to the Crown under and by virtue of a lease, licence or permit. R.S., c. T-6, ss. 2, 14.

Territorial Timber Regulations were enacted under the Territorial Lands Act in 1954, P.C. 1954-1214. These regulations appear to be the first timber regulations that stood alone and were not incorporated within other regulations. These Territorial Timber Regulations were modified in 1962 (P.C. 1962-1042) and the dues owing were reduced.

In 1979, the Territorial Timber Regulations were improved and we entered the metric age with the rest of Canada (C.R.C., c. 1528; SOR/79-508).

In 1987, as a result of the successful devolution of Forest Resources to the Government of the Northwest Territories the forest regulations were updated again. This time the name was changed to the ***Yukon Timber Regulations*** (C.R.C., c. 1528; SOR/87-191). As well, a few housekeeping changes were made. The Yukon Region was notified of these changes in the fall of 1992.

These are the regulations under which we now operate. In the nearly 100 years of time that has passed since the discovery of gold to the present, how have these regulations changed? The following table may help in comparing some of the major features (see Appendix 1 for conversion factors). (See Table 1)

Evolution of the Forest Management Section

According to the Annual Report of the Department of Resources and Development, volume 2, 1951-53, in 1952 The Commissioner of the Yukon Territory was responsible for field administration of forest resources with the assistance of a forest engineer based out of Whitehorse. Four wardens worked under the direction of the engineer. They were based at Whitehorse, Teslin, Kluane Lake and Mayo. During the fire season, seasonal wardens were also hired in Watson Lake, Whitehorse, Mayo, and Carmacks along with labourers and fire bosses.

Following the disastrous fire year of 1958, the Yukon Lands and Forest Service received a needed increase in staff. There was a field officer hired for each of the main communities of Yukon -- a staff of eight supported by regional staff in Whitehorse.

In 1972, the *Territorial Lands Act* was amended and the Territorial Land Use Regulations came into force. Most of the Yukon was exempted from these regulations, but did not prevent the increase of staff to provide at least one assistant for most of the existing districts. Then, in 1976, a reorganization within, what was known as, the Yukon Lands and Forest Service saw all field staff reporting to the Regional Manager of Field Operations. These are the people that deal directly with operational harvesting activities at the district level.

Forestry staff were now only regional Fire and Forest Management people. Both sections share administration personnel. For ease of illustration, I have reproduced the organization chart that is in effect today.

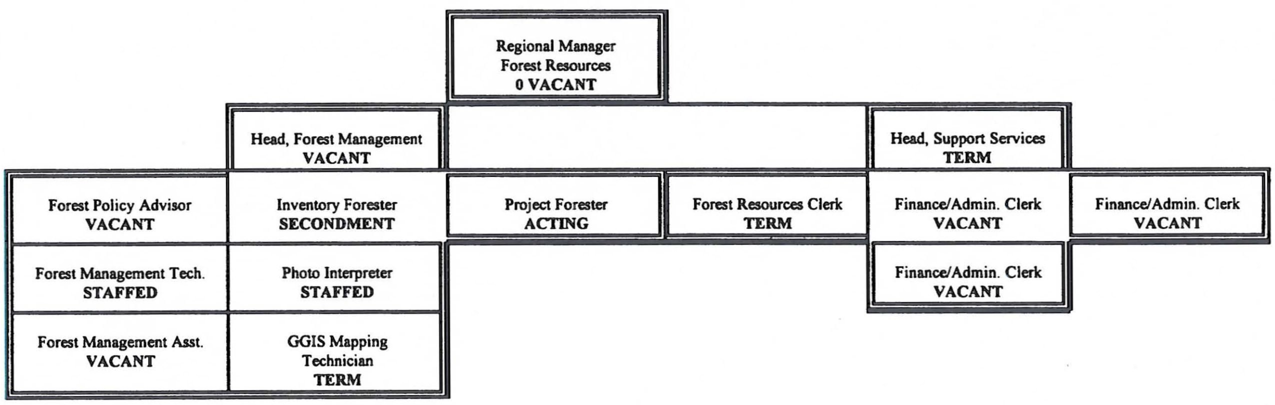
Table 1: Comparison of Rents and Dues for Lands, Permits and Wood 1902, 1952, 1962, and 1994

YEAR	BERTH/THA	PERMIT FEE	SAW TIMBER	CORD WOOD (green)	ANNUAL VALUE
1902	$\$250/Mi^2$	$\$5.^{00}$	$\$2.^{00}/Mfbm$	$\$0.^{50}/cd$	$\$36,178.^{60}$
1952	$\$100/Mi^2$	$\$2.^{00}$	$\$5.^{00}/Mfbm$	$\$1.^{00}/cd$	$\$39,554.^{04}$
1962	NO BERTH/THA	$\$0.^{00}$	$\$1.^{00}/Mfbm$	$\$0.^{50}/cd$	$\$56,028.^{30}$
1994/95	$\$6.55/Km^2$	$\$0.^{00}$	$\$1.^{13}/Mfbm$ $*4.^{53}/Mfbm$	$\$0.^{36}/cd$	$\$51,492.^{40}$ $*34,240.^{00}$

* refers to values from the Kaska Forest Resources Timber harvesting Agreement, excluding rental of $4,938.70.

It must be noted that none of the regulations cited make any reference to actually managing the forest or replacing the forest after harvest. Those authorities were not specifically given under the Territorial Lands Act.

Table 2: Organization Chart, Indian and Northern Affairs Program, Forest Resources Division (excluding Fire Management)



Forest Inventory

Through the 1950's, crews of the Canadian Forest Service out of the Petawawa Forest Research Centre made excursions into the Yukon and did preliminary surveys in the Nisutlin, McMillan and Pelly River areas.

In 1964, the Canadian Forest Service sent crews into Yukon to do preliminary forest assessment and inventory work in the Watson Lake and Marsh Lake areas. During that year, one far-sighted individual, the late John Wager, drew up land reserves for a sight above the Takhini River and within a triangle of land bounded between the Liard River, Watson Lake and old Alaska Highway. Timber inventory data were collected in the Upper Liard Drainage in much of what is now the Kaska Timber Harvest Agreement area and provided the original data on which the Yukon's first Timber Harvest Agreements were based in 1969.

In 1976, a shift in the organization resulted in a Forest Management section being set up. The purpose was to begin an in-house inventory of Yukon's forests. With only five people in the section, there were bound to be some constraints and delays.

In order to help with the lack of people in 1978, a development agreement was entered into with the Canadian Forestry Service out of the Northern Forestry Centre in Edmonton to develop a Large Scale Photo system which we call the "Pod" (Figure 1).

The system went through the normal bureaucratic hoop jumping exercise and in 1994 was fully licensed and ready to go.

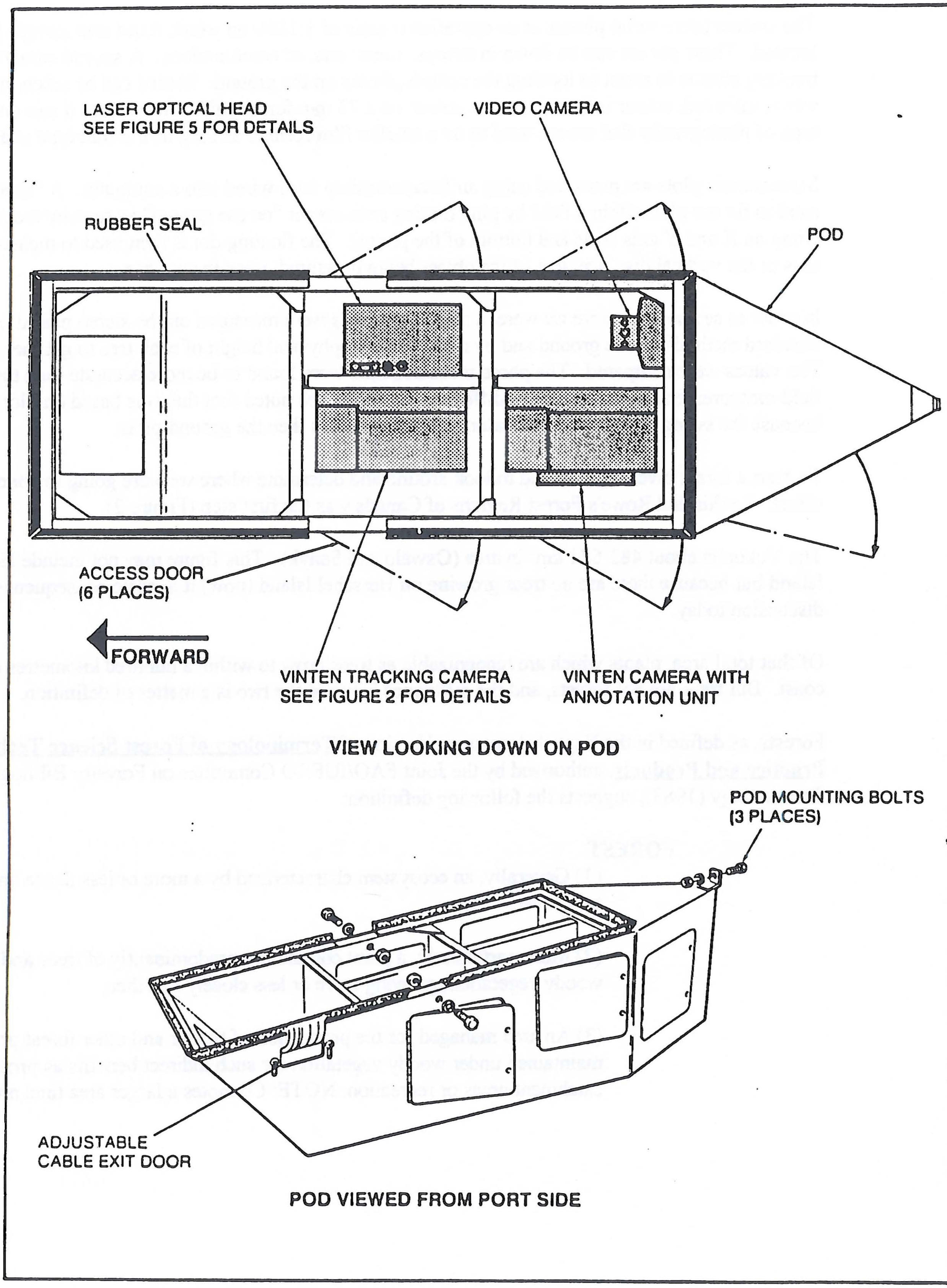


Figure 1: Large Scale Photo Pod
Indian and Northern Affairs
Forest Resources Division

The system takes aerial photos at an operational scale of 1:1000 on which fixed area sample plots can be located. These photos can be flown in strings, stereo sets, or combinations. A second camera takes tracking photos to assist in locating the sample photos on the ground. Photos can be taken in black and white, infra red, colour infra red, or true colour on a 72 mm format film. In essence, it can duplicate the type of photography that we are used to on a smaller film format, as long as the film type is available.

Stereoscopic plots are measured using an Interpretoskop hard wired into a computer. A "floating dot" is used to fix the plot within a field by pin pointing each corner "on the ground" as seen by the interpreter along an X and Y axis (side and bottom of the photo). The floating dot is then used to measure the Z axis or the vertical displacement of the object being measured, trees in our case.

In order to see how accurate we were, a number of plots were measured on the stereo paired photos, using standard methods on the ground and by measuring the physical height of each tree to get the true heights. The values were compared. The photo measurements were found to be more accurate then the standard field measurements by a significant difference. It should be noted that this was based on plot averages because the swing in errors were greater in the photo plots then the ground plots.

To start a forest inventory, we had to look around and determine where we were going to concentrate our effort. To this end Rowe's Forest Regions of Canada was the first step (Figure 2).

The Yukon is about 482 681 km^2 in area (Oswald and Senyk). This figure may not include Herschel Island but because there are no trees growing on Herschel Island (now) it is of no consequence to the discussion today.

Of that total area, plants which are recognizable as trees grow to within a hundred kilometres of the arctic coast. But trees are not forests, and the difference between the two is a matter of definition.

Forests, as defined in the English-Language Version of **Terminology of Forest Science Technology Practice and Products**, authorized by the Joint FAO/IUFRO Committee on Forestry Bibliography and Terminology (1983), suggests the following definition:

FOREST

(1) Generally, an ecosystem characterized by a more or less dense and extensive tree cover;

(2) More particularly, a plant community predominantly of trees and other woody vegetation, growing more or less closely together;

(3) An area managed for the production of timber and other forest produce, or maintained under woody vegetation for such indirect benefits as protection of catchment areas or recreation. NOTE: Connotes a larger area than a wood.

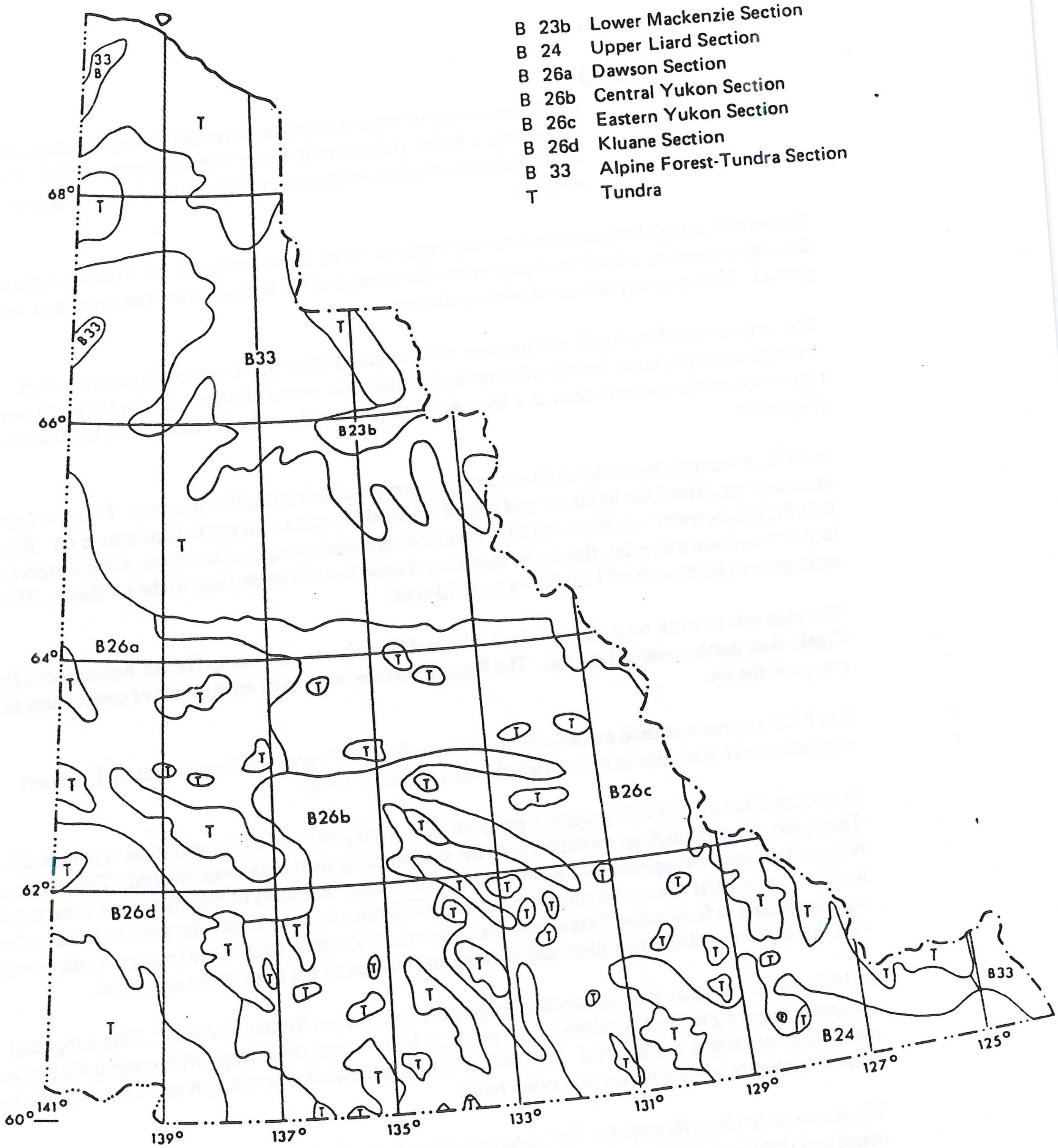


Figure 2: Forest regions adopted from Rowe (1972)

So then, what is a wood?:

WOOD

(1) A community of trees growing more or less closely together, of smaller extent than a forest and generally larger than a coppice. NOTE: It may or may not constitute a stand depending on its degree of homogeneity in one or more respects.

At this rate, any government forester may begin to wring his or her hands. In Yukon we generally describe a forest as a treed landscape where the crowns of the trees over top ten percent or more of the ground. This is an expression of relative density.

This overview of forest type and location set the limits within which we would start the work. The northern taiga has trees, but not of a size and density that would interest industrial exploitation. For that reason we set the northern limit at a line roughly equal to the southern extent of the Ogilvie Mountains (Figure 3).

In 1981, a reconnaissance level inventory was carried out using satellite imagery. This reconnaissance inventory confirmed the limits set and helped establish an order of areas to concentrate on. When the first Project Forester was hired in 1984, we had determined to begin where most of the commercial timber was known to exist, that is the southeast Yukon from Watson Lake to the La Biche. The management level scale of 1:50,000 was decided on.

The plan was to work west through the Teslin and Whitehorse districts to Haines Junction and Beaver Creek, then north towards Dawson. The Project Forester was given an estimate of seven years to complete the job.

The POD system was used extensively throughout the 1980's until the Department of Transport requested more complete licensing (which was granted in 1994).

In conjunction with the LSP project, a program establishing Permanent Sample Plots was initiated. These, too, went through an evolution until the system being used today was reached. These plots are being established throughout the forested regions of Yukon. In excess of 500 plots have been established to date. These plots allow us to measure actual growth rates on trees within the plots to better refine the equations used in forecasting future volumes. The one major draw back in the program is that we find it very difficult to establish new plots and relocate and remeasure old plots in the same year.

In 1984, Forest Management acquired a Geographic Information System--PAMAP. This integrated computer mapping technology allows us to produce digital forest cover maps with geographic and man-made features located and labelled. PSP and LSP plots are recorded on the system. This combined use of methodologies is what we are still using today.

We are about halfway through the first inventory (Figure 4). At this time, we are proceeding, both in-house and through contract, over an area in the Salmon Forest Management Unit, Y08 (Figure 5). Of the area completed to date, 32 percent is non-productive, 3 percent not sufficiently restocked (NSR), 29 percent is forested, and the remaining 36 percent is "other" (including lakes and streams, mountain tops, and highways) (Figure 6).

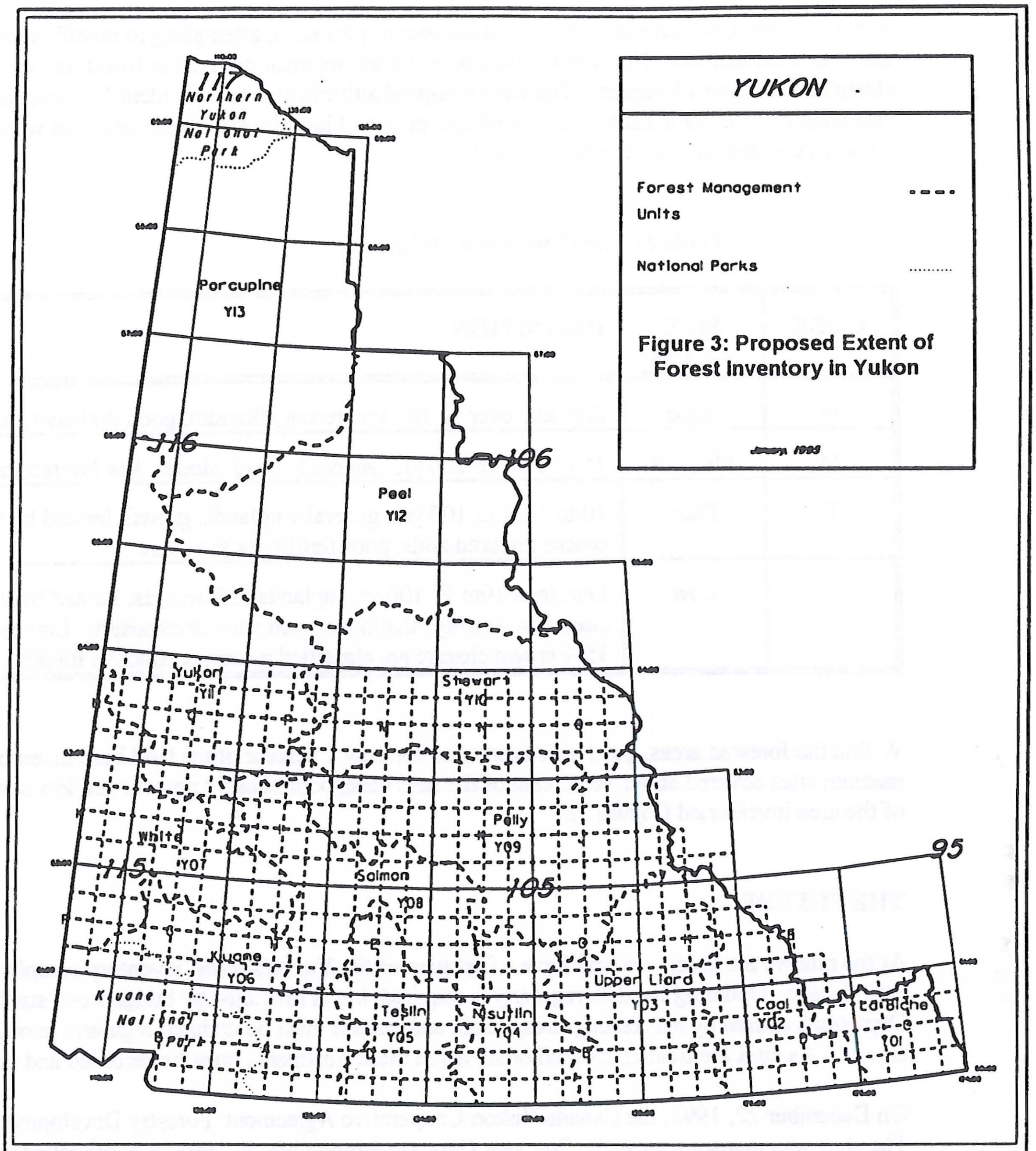


Figure 3: Proposed Extent of Forest Inventory in Yukon

In our evolution, we have gone through a number of periods in attempting to modify southern terms and usage to local realities. Non-Productive Forest Lands are areas covered in forest, but on which the crown closure is less than 15 percent. The term non-productive is also used to identify non-treed areas that are vegetated by grass or shrubs. Good, medium, poor and low site classes are areas on which trees grow at a faster rate relative to each other (Table 3).

Table 3: Site Classes and Definitions

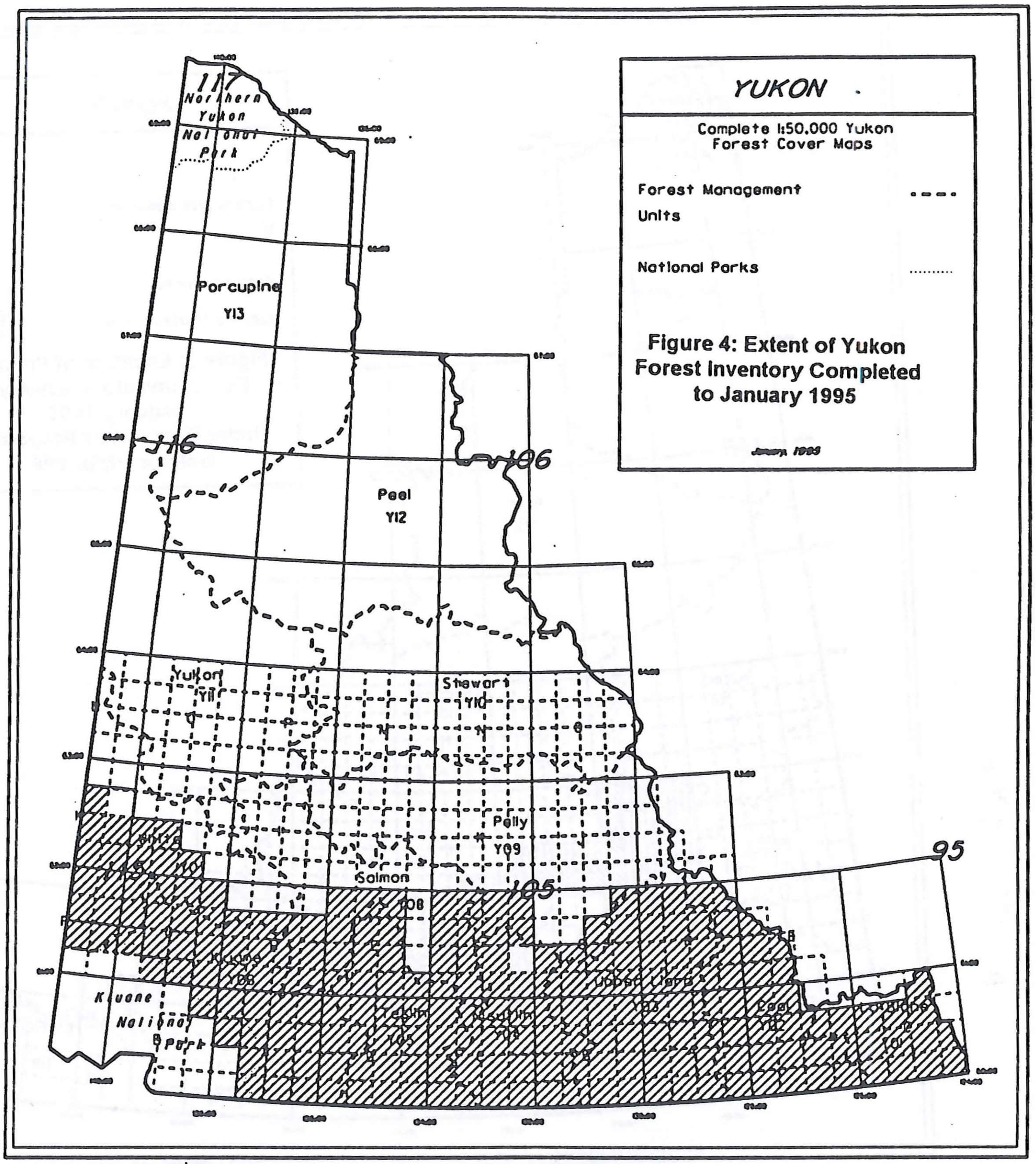
CODE	SITE CLASS	DEFINITION
G	Good	20m and over @ 100 yrs, recent alluvium, good drainage and fertility
M	Medium	15 to 19m @ 100 yrs, generally lower slopes, few limitations to growth
P	Poor	10 to 14m @ 100 yrs, generally uplands, growth limited by wet or dry sites, coarse textured soils, poor fertility or exposure
L	Low	Less than 10m @ 100 yrs, uplands or lowlands, limited by very wet or dry sites, low fertility, shallow or cold soils or exposure. Low sites with less than 15% crown closure are classified as non-productive forest.

Within the forested areas, good sites accounted for only 1 percent of the land base inventoried while medium sites covered about 16 percent of the land base, poor sites 59 percent and low some 24 percent of the area inventoried (Figure 7).

THE FUTURE

At the rate we are going, we may have a first pass of the Yukon's forest inventory completed within the next decade. Updating the data regularly is required, but is restricted by budgets and staffing. Depletions caused by harvesting, fires, insect and disease must be updated regularly in order to stay current. As sites are treated, planted or surveyed these treatments must be recorded and tracked.

On December 22, 1992, the Canada Yukon Cooperative Agreement: Forestry Development was signed. The start was inauspicious -- the first year (January through March 1993) was cancelled as a result of a federal spending freeze. In time the agreement was allowed to work. Since the inaugural project on the history of logging in the Yukon from 1896 to 1970 was tendered to the ongoing site preparation project in the Watson Lake and Beaver Creek Districts, the program has funded the regeneration surveying of 1600 hectares of harvested lands, the site preparation of 751.5 hectares of land (including the present project) by a variety of methods, and the planting of 623,024 white spruce seedlings. The program has also funded a variety of research projects, including the development of an Ecosystem Classification System for the southeast Yukon, a Riparian Zone study, and a Forest Industry employment report. A total of $2.7 million dollars was initially allocated to the CA:FD, a much needed infusion of funds for basic forestry in the Yukon.


YUKON
Complete 1:50,000 Yukon Forest Cover Maps
Forest Management Units
National Parks
Figure 4: Extent of Yukon Forest Inventory Completed to January 1995
Northern Yukon National Park
Porcupine
Y13
Peel
Y12
Yukon
Y11
Stewart
Y10
Pelly
Y09
Salmon
Y08
Kluane National Park
Teslin
Upper Liard
117
116
106
105
95

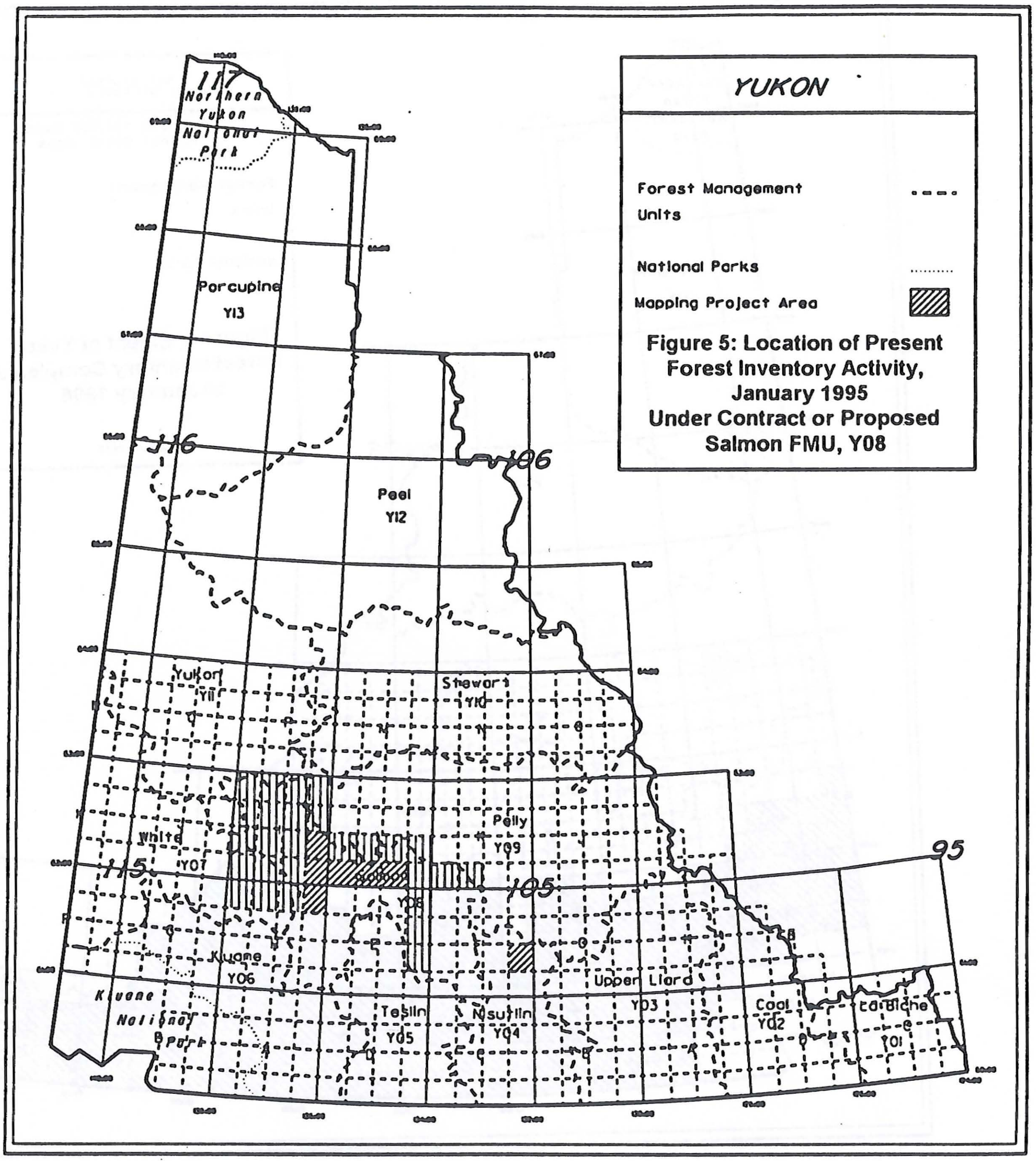


Figure 5: Location of Present Forest Inventory Activity, January 1995 Under Contract or Proposed Salmon FMU, Y08

TOTAL INVENTORIED LAND
(158,683 km2)

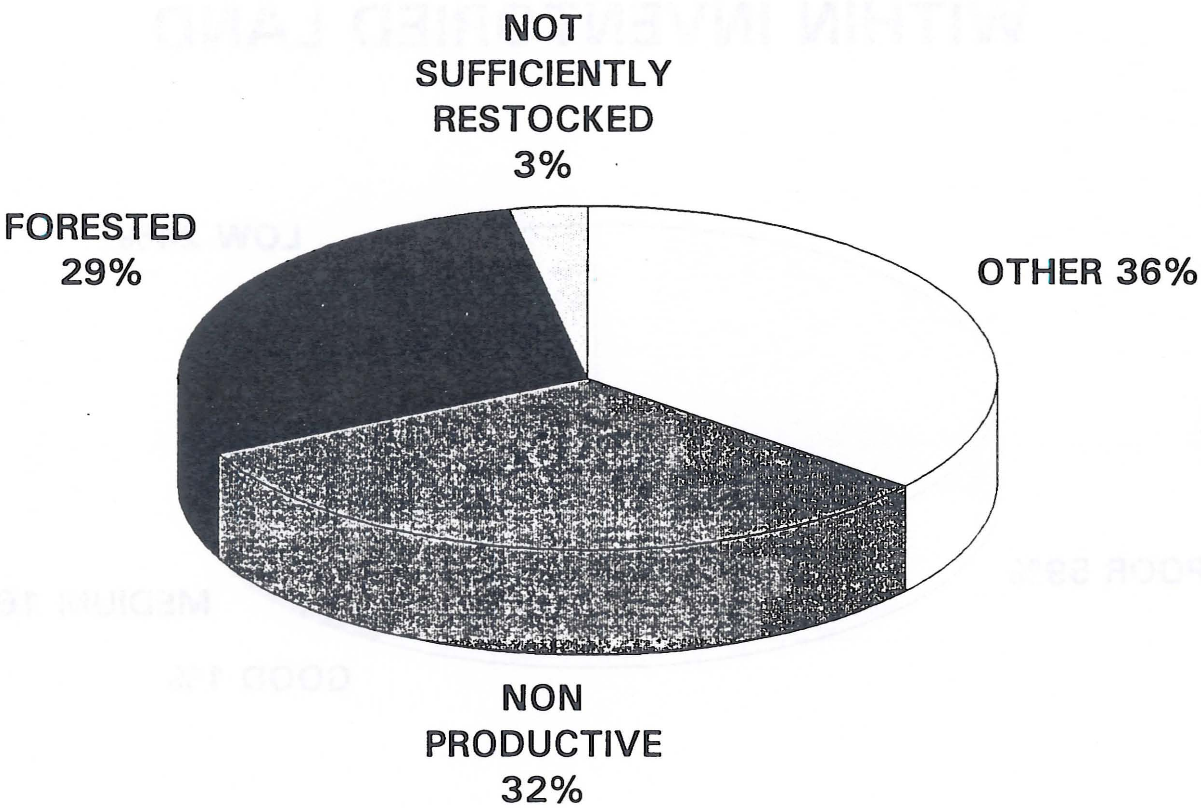


Figure 6: Total Inventoried Land Breakdown by Broad Forest Class

FORESTED AREA BY SITE CLASS WITHIN INVENTORIED LAND

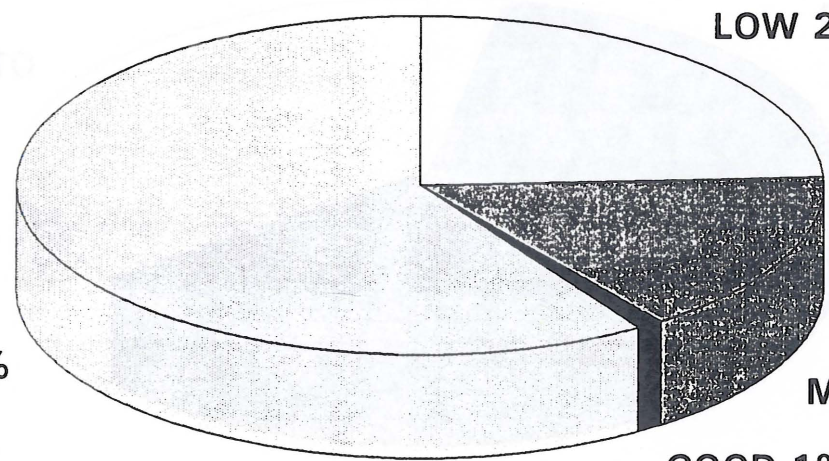


Figure 7: Forested Area by Site Class Within Inventoried Land

I hope that a second agreement will be negotiated to continue on after the present agreement ends in March of 1996. Where this first agreement was designed to alleviate some of the backlog of NSR (which we have fallen behind on again this season), the next must do more to answer basic questions on growth and recovery in Yukons portion of the boreal forest. Research on seeding versus planting options, optimal seedling plug size for site type, tree fibre physiology and product potential, block size effect on wildlife, and harvesting options should be undertaken. We will need a greater degree of expert assistance on research design from the Canadian Forest Service.

On January 19, 1995, the *Canadian Environmental Assessment Act* was proclaimed law. Section 20 of the Act reads:

> **20**. (1) The responsible authority shall take one of the following courses of action in respect of a project after taking into consideration the screening report and any comments filed pursuant to subsection 18(3):
> (a) subject to subparagraph (c)(iii), where, taking into account the implementation of any mitigation measures that the responsible authority considers appropriate, the project is not likely to cause significant adverse environmental effects, the responsible authority may exercise any power or perform any duty or function that would permit the project to be carried out and shall ensure that any mitigation measures that the responsible authority considers appropriate are implemented;

Forest Resources has been left without the ability to ensure any post harvesting silvicultural activity takes place. The Canada Environmental Assessment Act now gives us that authority.

Over the past two years forestry, as an industrial operation, has come to the forefront. No week goes by without some letter to the editor of editorial comment being made in the local newspapers or interview on the local radio stations. The arguments are many, but one sentiment comes through quite clearly and was stated quite simply in a letter printed in the Whitehorse Star on Tuesday, January 17th 1995.

In the letter, written by Jim Borisenko of Carcross, a rehash of the opinions expressed by an former Regional Manager of Forest Resources on the environmental effects of clear cut logging and arguments against clear cutting he said, "...please, leave the development of the Yukon's forest resource to Yukoners."

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Yukon Timber Regulations, C.R.C., c. 1528; SOR/87-191

APPENDIX 1

CONVERSION FACTORS

1 m^3 stacked	= 0.6250 m^3
1 m^3	= 1.6 m^3 stacked
1 cord	= 3.6 m^3 stacked
1 m^3 stacked	= 0.28 cord
1 cord	= 2.25 m^3
1 m^3	= 0.44 cords
1,000 FBM	= 5.6634 m^3
176.57 FBM (sawn)	= 1 m^3
1 Ha	= 2.47 acres
1 acre	= 0.40 hectares
1 m^3/Ha	= 0.111 cords/acre
1 cord/acre	= 8.956 m^3/Ha

Convert

QUESTION PERIOD

Topic: State of Yukon's Forests
Speaker: Don White

Q: Don, in your diagram you said that one percent of the forested area is classed as good forest and people are still looking for it. Does that imply that it hasn't been cut?

A: No, in that area that we have inventoried so far, only one percent of that total area has been forested and that we actually consider to be good. So, based on the measurements -- the ground truthing, and so on, one percent has hit 20 metres in 100 years; the rest is somewhat slower. I know that when they did the Greater Kluane Land Use Management Plan, there were two blocks of timber out there and they are far enough off the Alaska Highway that it might take 10 or 20 years for a logger to find it. With the other stuff, we all know there is a fair amount of fairly quick-growing timber in the Watson Lake area -- whether it happens to be in the timber harvest agreement area, or whether it happens to be outside of the agreement area; whether it happens to be near the blow-down area that is being harvested in the Labiche -- it just doesn't amount to a whole lot of timber that is really fast-growing.

Q: I am not from the Yukon, and this is the only part of Canada where the federal government is in the forest management business. Could you review for those of from outside of the Yukon what authority the federal government has to sell timber and how it is sold?

A: It is basically covered under the territorial *Lands Act*. The authority is granted in the legislation itself and the legislation basically says that "No person shall cut timber on territorial lands unless the person is the holder of a permit." The Government of Canada gives itself the right to control that. If, and when, devolution ever occurs, that right will be passed from the federal to the territorial government, and the same kinds of rules will apply. That is the way it is handled in the provinces. If you end up wanting to harvest timber, you approach the local district officer and apply for a permit, and take it from there. Without the legislation, the authority doesn't exist.

Q: My name is James Allen, and I'm from Champagne-Aishihik. I would like to know -- there is a beetle infestation in our area. Are any of those trees up there within the one percent that you have in your diagram?

A: I honestly don't think so. From what I recall, they are further north from where the infestation is. There is one in the area -- I think it is Hutshi Lake -- and another one that is over toward the mouth of the Donjek.

Q: Why are the logging companies so eager to get in there, then, if it's labelled as not so good, or whatever you call it?

A: I am being a little bit facetious. It's just that, from what I've seen with the development that is going on in Watson Lake, as an example, I can't tell you how many permits have been issued there, but I don't think there is very many of them that are much more than, say, 10 miles, at the most, off of the Alaska Highway. So, I figure those areas are relatively safe -- for the interim, anyway.

HISTORY OF LOGGING IN THE YUKON: 1896 - 1970

by

Kathy Bisset
K.Bisset & Associates

This project was initiated in September 1992 and completed in June 1993 to:
- complete a chronological history of logging from the gold rush to modern times from 1896 to 1970;
- provide volumes and location of cutting activities in database format;
- review logging methods and management practices.

This project was initiated by Forest Resources (Northern Affairs Program under the Canada/Yukon Cooperative Agreement; Forestry through Economic Development, Government of Yukon.

Approximately 175 articles, ledgers, files, books, reports and other documents were reviewed. Records at the Yukon Archives, included listings of wood taken aboard by steamers, sawmill returns, timber cutting permits, timber berth applications and inspections. Early timber records were kept by the North West Mounted Police (NWMP) and mining agents. Later, federal land management officers managed forestry activities and records were kept for each district.

HISTORICAL SUMMARY

Historical information was divided into three periods of activity; Gold Rush Period (1898-1916); Steamers/Mining/Expansion Period (1917-1949); and Modern Period (1950-1970). Logging has been associated primarily with mining and transportation activities, with two short periods of intensive activity, during the Gold Rush (1896-1901) and during the construction of military defense projects of World War II (1942-1945), including the Alaska Highway, the Haines Road and Canol Pipeline projects.

GOLD RUSH PERIOD (1896-1916)

Prior to the gold rush, the forest provided the native cultures with materials for dwellings, fuelwood and basic needs. As the white traders and prospectors arrived, small settlements and trading posts were established, utilizing local forest resources. Several sawmills existed as adjuncts to established trading posts.

(SLIDE#1)
In 1895, the North West Mounted Police (NWMP) arrived to construct a post at Fort Constantine, on the Yukon river about 70 miles downstream from the future site of Dawson. Logs were cut upriver, rafted and floated down, hewed or sawn square before use. A settlement developed nearby at Forty Mile, where in August 1896 George Carmacks recorded his discovery claim on Bonanza Creek, to the southeast which was to be the centre of the Dawson goldfields and the goldrush which followed. Additional police posts were to be constructed to form a chain of communication from one end of the territory to the other.

The massive influx of prospectors and stampeders in 1898 created the first rush on Yukon timber requiring timber for mining; (cripping, thawing ground, flumes etc.) for transportation; (steamer fuelwood, boat construction [rafts to steamers], railroad and road/trail construction [railroad ties, bridges, road corduroy], for fuelwood; and for shelter; (from basic cabins to hotels).

Stampeders reached the Klondike by several routes; **(OVERHEAD #1)** from Haines; along the Dalton Trail, a toll road of 305 miles, following the old Chilkat route from the coast north by Dezadeash and Aishihik Lake to Yukon Crossing on the Yukon River; **(SLIDE #2)**
from Skagway; gear was hauled over the Chilkoot Pass, boats were constructed at Lake Lindeman and Lake Bennett to continue down the Yukon River system to Dawson. **(SLIDE #3)**
The construction of the WhitePass Yukon Railway began in 1898 in Skagway,Alaska **(SLIDE #4)** and by July 1899 had reached Lake Bennett. Steamers transported materials and stampeders from Lake Bennett **(SLIDE#5).** In 1900 the railroad was completed to Whitehorse. Sawmills developed along the routes to the Klondike to create lumber for boat and building construction. A sawmill was located in Carcross, known as the Kings Mill. **(SLIDE#6)**

(SLIDE #7) Whitehorse became the head of navigation for the Yukon River and the site of a boat building shipyard for the British Yukon Navigation Company. **(SLIDE #8)** Steamers operated from Whitehorse to Dawson from 1898-1956. At the height of the gold rush up to 250 sternwheelers plied the rivers of Yukon and Alaska. **(SLIDE#9) (OVERHEAD#S-9)** From Whitehorse to Dawson City a distance of 460 miles, the sternwheelers burned about 80 cords downstream and upstream about 100-180 cords at the rate of 1 to 2 cords per hour. Every 4-5 hours they would stop at one of the woodcamps along the river. Woodcutter camps and settlements were located approximately 25-30 miles apart. **(OVERHEAD #2,3,4)**

(SLIDE #10) (OVERHEAD#5)
Cords of wood were usually cut and hauled to the riverbank in the winter. Wood had to be 4 feet long, not more than 8" at the butt or less than 4" at the small end. Smaller boats used 3 ft lengths. Wood was piled by the rivers edge 6ft high and 4ft wide in double tiers. Sternwheelers docked, a gangblank was put ashore and wood was loaded on a little 2 wheel hand "truck up" and wheeled on board. The wood was loaded as fast as possible and crews could load up to 16 cords in 40 minutes. Usually 8-15 cords were taken per stop depending on the cargo space. Records were kept of wood taken at each stop for each trip. The steamers of the British Navigation Company consummed some 8000 cords each during the season. **(SLIDE#11).** Over 300,000 cords were consummed between 1898-1956 along the Yukon River.

In the Dawson area, wood was being utilized at an alarming rate.
(SLIDE #12) As wood became scarce, timber was acquired on commercial timber berths further upriver and transported down by rafts. Timbers were quickly made into cabins, cordwood or sawn lumber by the 12 sawmills in operation. These included the Joseph Ladue sawmill, the Klondike Mill company, the Arctic Sawmill company and Canadian Yukon Lumber company. Fuelwood was consumed for domestic purposes **(SLIDE #13)** as well as for the thawing of ground. **(SLIDE #14)** Mining activities required timber for buildings, tramways, cribbing, sluice boxes, and flumes. **(SLIDE #15,#16).**

In 1900 alone, over 700 commercial permits were active in the Yukon (with the majority near Dawson), over 70,000 cords were cut, and 7 million FBM of lumber produced.

(SLIDE#17)
In 1902, the "Overland Trail or New Government Road" was constructed from Whitehorse to Dawson, a distance of 340 miles. **(OVERHEAD #6)**. From 1902 to 1924, the Whitepass & Yukon Route Company provided winter transportation along this route using horses and sleighs. Roadhouses and stables were located approximately 20 miles apart, built with local timber and heated by roaring fires.

(SLIDE#18) (OVERHEAD#S-18)

During the gold rush, the Dawson area was the most active district for mining related projects. In 1905 the first dredge (Canadian No. 1) was put into operation at Bear Creek. In 1906, the construction of the Klondike Mines Railroad was initiated to provide a 32 mile long railway to transport fuelwood and building materials, etc. from Dawson to the goldfields until 1914. In 1906, records indicate that 44,944 ties were manufactured for this railroad. The Yukon Ditch was also started in 1906, completed by 1908, providing water and power from the Twelve Mile river north of Dawson to Gold Hill on Bonanza Creek. Construction included 19.6 miles of flume, **(OVERHEAD #7)** 38 miles of ditches and 12.6 miles of pipe. **(OVERHEAD #8)** Ditches were made with steam shovels and a wooden stave pipe from redwood staves from California. A sawmill was located in the Twelve Mile River area, which provided utilized native timber for flumes and piling. In 1907, 7,192,894 FBM were manufactured at 12 Mile sawmill.

The first timber regulations were issued in 1898 for timber berths, issued from Ottawa, where a berth could not exceed five square miles nor be less than one mile in breadth and not allowing more than five berths per any one company. There was confusion in administering these regulations by the NWMP and mining agents at the major posts, including Tagish, Whitehorse, Big Salmon, Fort Selkirk, Stewart, Dawson and Forty Mile.

After the goldrush there was a rapid exodus of the territory population, from 27,219 in 1901 down to to 8,512 in 1911. Most of the good mill logs had been removed from the creeks along the Yukon River both upstream and downstream from Dawson. **(SLIDE#19) (OVERHEAD#S-19)**. Inspector reports from the Dawson District Agent in 1910 and 1911 revealed that wood piles remained on the riverbanks and good, easily accesible wood was limited.

Report Dawson District 1910.
"Mosehide Creek to the last creek 12 miles below Dawson have all been cut over; below the Twelve Mile creeks are practically denuded of wood, most of it reported as being cut in the 1909 season and taken to Alaska, without dues paid.
The methods used by loggers and woodchoppers is that they use only the choicest of the wood and mill timber, leaving behind considerable wastage on the ground. Another destruction of wood is the burning of timber by wood contractors to make dry wood. The loss from this souce is appalling, all the dry wood is totally destroyed besides many million feet of sawlogs. I recommend prohibiting the use of mill timber for wood, making the penalty heavy for seting out fires to make dry wood, cancelling all permits and timber berths for persons guilty of the enormous destruction of timber. This would aid in the conservation of the timber resources of the territory." Chas.R.McLeod.

Report Dawson District 1911.
A total of 4105 cords were mentioned as cut at the various creeks along the Yukon River from above Minto to the Indian River above Dawson.
"From about 7 miles above Minto all the timber has been cut. **(OVERHEAD #9)** There is still lying on the banks of the river 150 cords of 16 ft wood belonging to Maynard, cut in 1910 on Timber Berth No.72."

In 1901 a discovery claim for gold was staked on Duncan Creek in the Mayo District. This sparked a new gold rush with stampeders entering the district. Highet Creek was staked in 1903. Mayo Landing was established in this year. In 1913, the Silver King was staked for galena or lead-silver ore on Galena Creek. This sparked new mining development with timber required for underground shafts and tunnels. Ore was brought by horses and sleds to Mayo to await shipment to the smelter in San Francisco. In 1914, the steamer 'Vidette' took the first shipment of silver-lead ore out of the district via the Stewart and Yukon Rivers to Whitehorse.

STEAMERS/MINING/EXPANSION PERIOD 1917-1949

Mining development continued in the Dawson and Mayo Districts. **(SLIDE #20)** The construction of dredges to work the Klondike goldfields brought a need for lumber and fuelwood for the steam engines as well as for the thawing of ground prior to dredging.
(SLIDE #21)

Sawmills existed near the settlements, their operations varying from steam power to small caterpillar tractor driven saws. **(SLIDE #22&23)** Buzz saw Jimmy developed a unique portable saw on the Whitehorse waterfront. **(OVERHEAD#10)**

Both gold and silver ore mining continued to be active in the Mayo District. **(SLIDE#24)** In 1920, the Yukon Gold Company formed Keno Hill Ltd. to consolidate their holdings in the Keno Hill area. The Treadwell Yukon Company established in the district in 1921. Sawmills in Mayo provided lumber and milled timbers for shafts, including the Kimball Brothers sawmill. **(SLIDE#25)** Timber was harvested along the McQuesten, Stewart River and Mayo Lake areas. **(SLIDE#26)** The sternwheeler 'Keno' completed in 1922 operated along the Stewart River until 1951, bringing the ore by barges to Stewart Island (a distance of 180 miles) for transfer to other steamers going upstream to Whitehorse and by rail to Skagway. Werneke and Elsa camps were developed. **(SLIDE#27)** In 1936, the mill at Elsa processed 150 tons/day. After 1923 cat trains were used to haul wood **(SLIDE #28)** to the mines in Elsa and Keno and the ore from there back to Mayo. Later trucks were utilized. **(SLIDE#29)** Treadwell Yukon ceased operation in 1942, the mine remaining idle during World War II and beginning production again in 1947 under the name United Keno Hill Mines Ltd.

(SLIDE#30) (OVERHEAD#S-30)
In 1942, the U.S. Army initiated the construction of the Alaska Highway in Dawson Creek, to build a 1513 mile road to Fairbanks Alaska. Each regiment was assigned one sawmill to mill lumber for housing and bridge construction. Firewood was needed in large quantities. **(SLIDE#31&32)** **(OVERHEAD #11)** In 1943 there were 21 sawmills in operation to mill lumber for the construction of bridges, military camps, relay stations and airports. **(OVERHEAD #12)** A total of 133 permanent bridges of various types were designed, and of these, contractors had completed 99 by the end of October 1943. Most were short wooden trestle spans built with native timbers.**(SLIDE#33&34)** **(SLIDE#35&36) (OVERHEAD #S-36)**

The construction of the Haines Road and Canol pipelines were also constructed in 1943-44 to bring oil from Norman Wells to support the war effort. A refinery and tank farm was built in Whitehorse a distance of 577 miles of pipe and ten pumping stations. The steamers were also used to transport army vehicles and equipment to Eagle Alaska.**(SLIDE#37)**
"Timber cut under free permits for joint defense construction projects in 1943 included 14,500,463 FBM of sawn lumber, 49,356 cords, 14,500,463 FBM sawn lumber and 618,123 linear feet of timber for bridge, piling, building logs and telephone poles." 1943 Annual Report
(SLIDE#38) Rafts continued to be made, cut from timber berths located along the Stewart and Pelly Rivers, and floated downstream to Dawson. (A telgram from Fort Selkirk to Dawson in September 1947 indicated a raft would be arriving in six days with approximately 220 cords of wood.)

In the Mayo District, logger Jack MacKenzie kept personal work diaries. In 1949 he logged on timber berths above Fraser Falls on the Stewart River skidding logs to landings with a D-2 cat from January-July, cutting about 300 trees/day in the summer months. Logs were rafted down to the Mayo sawmill in August and September, some rafts containing up to 4,000 logs. New timber stands were found in October, cutting and skidding to landings continued through December.

MODERN PERIOD 1950-1970

In 1950, the highway from Elsa to Mayo and to Whitehorse was finished. By 1953 this was extended to Dawson City. This marked the end of the steamboat era and the centre of government was moved from

Dawson to Whitehorse. Bridges were constructed over the Pelly and Stewart rivers in 1960. In the late 60's the Dempster and Robert Campell highways were completed.

The Mayo District continued to be active for timber harvesting to provide stulls, cribbing and lagging for United Keno Hill Mines Ltd. Usually a tree was milled into products: the bottom section for sawlogs, next for stulls (diameter 9-12"), then cribbing (5-9"), and lagging (2-5").
The Watson Lake sawmill began producing in the fifties. In the mid 60's, Acorn Timber Ltd. obtained timber rights in the Pelly River and Macmillan River areas and opened a mill just north of Whitehorse, becoming the north's largest producer of sawn lumber products.

FOREST MANAGEMENT

(OVERHEAD#13)
Formal Timber Regulations were established in 1954 with dues at $.50/cord for dry wood and $1.00/cord for green wood, $2.00 (poplar) and $5.00(other)per million foot board measure (M. FBM). New regulations in 1962 halved these dues. Sawlogs were reduced to $1.00 per M. FBM for all species. There were no dues charged for timber used for mining purposes on mining claims.

Resource management districts were established to manage timber. Inspections were conducted management officers. **(SLIDE #39) (SLIDE #40)** A map, stained by floodwaters, was found in the Mayo District files, indicating districts in the early 1950's, including Whitehorse, Haines Junction, White River, Carmacks, Teslin, Watson Lake, Mayo and Dawson.
(SLIDE #41) (OVERHEAD #S-41) In the early 1970's, the Yukon was divided into 10 districts, dividing the Whitehorse district to Tagish and Laberge, dividing the Carmacks district to add Ross River and changing White River to the Beaver Creek district. The boundaries of Dawson and Mayo districts remained the same.

For the purpose of locating cutting activities a series of figures (67) were developed for each of the ten resource management districts. For each figure, logging zones or polygons were created to define cutting locations for volume information. **(SLIDE# 42) (OVERHEAD#S-42)**

DATABASES

Databases were prepared, grouped into four categories according to time period and type of information available. Volumes were determined for each polygon or logging zone, for each year of activity in each database.
(OVERHEAD#14)
Transportation Activities - Rivers, Roads and Trails
1899-1916
1935-1949
The Transportation database included two periods of records, with a total of 308,168 cords cut within six logging districts within 49 logging zones, located primarily along the rivers. Cordwood was used mostly for steamer fuelwood and mining activities.

(OVERHEAD #15)
General Activities - General Timber Permits
1947-1970
This database included all volumes issued for general activities by each resource management district. A total of 115,649 cords were cut from 1947 - 1970, the highest amount was cut in the Mayo district at 23682 cords, with Laberge second highest at 23682 cords. Watson Lake and Tagish had the most green cordwood cut. The districts with the most lumber manufactured were the Tagish, Mayo and Watson Lake districts. A majority of the ties for the Whitepass & Yukon Route railroad were cut in the Tagish district at 24,543 ties from 1956-1969.

(OVERHEAD #16)
The annual summary of volumes cut each year indicate fluctuations in activities for all districts. Records from 1947-1950 represent those of the Mayo area only. In 1953 the cutting of fuelwood began to decrease with the decline of steamer activity and by 1958 only 2627 cords were cut in the Yukon during this year. In 1968, the highest amount of lumber was manufactured and dry cords were cut for this database.

Commercial Activities - Timber Berths, Sawmills
1898-1913
1947-1970

Records of commercial timber berths were from 1898-1913 and 1947-1970. There was no timber berth information located for 1913-1947 other than in the Annual Reports. **(Overhead #17)** A total of 136 berths were recorded in the early period with the most in the Dawson District (69), along the Yukon and Stewart Rivers. **(Overhead #18)** 246 berths were recorded in the later period with the majority in the Mayo district.

Annual Reports - Commercial, General Activities
1900-1961

The Annual Reports prepared by the Department of Interior, Ottawa, were summarized including general and commercial activities. **(Overhead #19)** For general activities between 1900-1904, volume information was compiled into five subagencies, including 40 Mile, Fort Selkirk, Whitehorse and Dawson from 1900-1904 and afterwards as Dawson or Yukon regions. A total of 8876 timber permits were issued, the highest amount was in 1900 at 698 permits, also the highest amount of cordwood at close to 70,000 cords. Between 1914-1933, 8472 cords were seized for unlawful cutting. In 1951, the highest production of linear feet(LF) was recorded at 1,074,691 LF.
(OVERHEAD #20) For commercial activities a total of 1487 berths were registered between 1900-1961, noted as Dawson or Yukon. The highest amount of FBM (slightly less than 8 million) was produced in 1902. The highest amount of cordwood (for this database) was recorded in 1909 at 19,572 cords.

CORDWOOD COMPARISON 1899-1970

(SLIDE# 43) (OVERHEAD#S-43)
A comparison of the records was made for cordwood from 1899- 1970, comparing amounts from the Annual Reports, Colin Heartwell's review in the "Forest Industry in the Economy of the Yukon" and the Transportation and General databases created as part of this project. Two peaks of activity occurred in 1900 and 1943. **(OVERHEAD#21)**

SITE SURVEY

An aerial field survey by helicopter was also completed along the Yukon River from Carmacks and along the Stewart River to assess regeneration of the forest at the numerous woodcamps and millsites. **(SLIDE#44,45)** Generally it appeared that the cutting areas from the early 1900's were regenerating with spruce in a satisfactory manner. Density and growth varied with site conditions. **(SLIDE#46,47)** A site on the Stewart River, used for steamer fuelwood was the site of a controlled burn by Forest Resources in the early 1970's. **(SLIDE#48&49)** This now has dense regrowth of spruce. General Enterprises had a number of millsites in this area during the 1960's, to haul lumber for United Keno Hill Mines. **(SLIDE#50 &51)** The millsite area has a large slab pile remaining with poplar growth. Adjacent is a stand where the larger timber had been selectively removed. The younger timber left standing is now mature.

DESCRIPTION OF SLIDES:

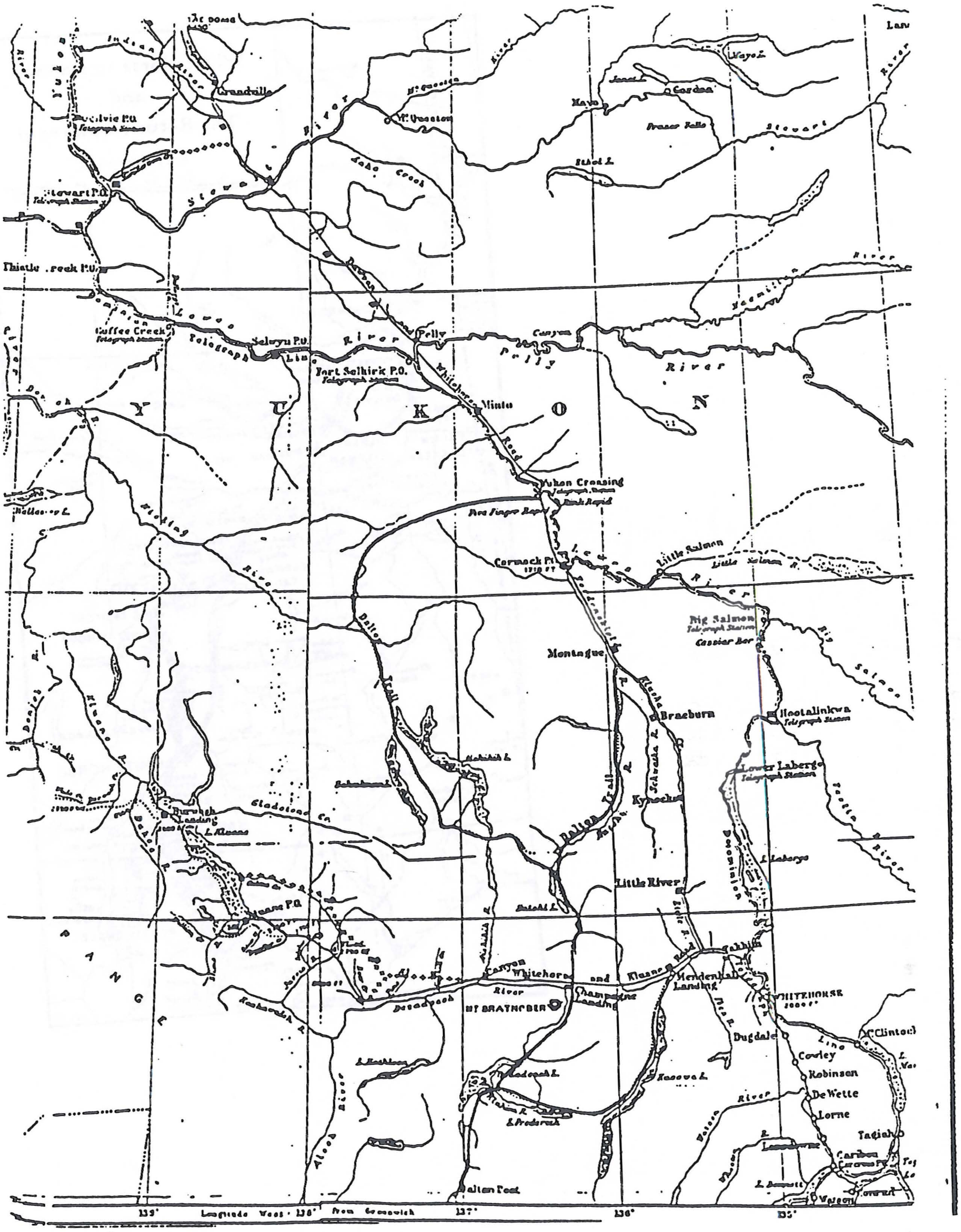
#1: Fort Constantine - North West Mounted Police Post-1985
#2: Road Corduroy used for Early Roads and Trails - 1898
#3: Whipsawing for Boat Construction at Lake Bennett -1898
#4: Whitepass & Yukon Route Railroad - Whitepass -1899
#5: Steamer & barges leaving Lake Bennett - 1899
#6: Kings Mill in Carcross
#7: Whitehorse - Head of Navigation - 1900
#8: Building 'Dawson' & 'Whitehorse' sternwheelers in the British Yukon Navigation Co.shipyards, Whitehorse-1901
#9: Whitehorse-Dawson Map -showing settlements & camps along Yukon River from Southern Lakes to Dawson (included as Overhead # S-9)
#10: Steamer stopping for wood along riverbank
#11: British Yukon Nvigation Co. Record - 1902 - 991/2 cords used from Reindeer Creek above Dawson to Whitehorse on Yukon River #12: AEC steamer with large rafts in front in Dawson
#13: Women prostitutes in Dawson working on fuelwood
#14: Men in Dawson goldfields thawing ground
#15: Men on tramway system for claim Dawson Goldfields
#16: Cribbing used on claim - Last Chance Creek - Dawson
#17: Whitepass & Yukon Route Stageline - Old Dawson Winter Road
#18: Dawson Goldfields - Klondike Mines Railroad - Yukon Ditch (included as Overhead #S-18)
#19: Government Fuelwood Report - 1909-1910 (included as Overhead #S-19)
#20: Dredge Construction of No.4 on Bonanza Creek - Dawson
#21: Thawing ground before dredge on Bonanza Creek - Dawson
#22: Sawmill operated by steam power - Burwash Landing 1920
#23: Small caterpillar tractor used to cut logs - Mayo
#24: Map of Mayo Mining District
#25: Kimball Brothers Sawmill in Mayo
#26: Sternwheeler 'Keno' in Mayo which transported or on Stewart River
#27: Elsa Camp - woodpile and miners in front of tunnel
#28: Caterpillar tractors used to haul timbers to mines - Mayo
#29: Hauling with trucks - Yukon Treadwell Company - Mayo
#30: Alaska Highway and Canol Projects 1942-1945 - Overview Map (included as Overhead #S-30)
#31: Cone shaped woodpile - Coal River Way Station
#32: Whitehorse Camp - Alaska Highway
#33: Building Road with native timbers
#34: Bridge at Canyon Creek
#35: Portable sawmill along Alaska Highway
#36: Description of bridges - stringers used (included as Overhead #S-36)
#37: Army vehicles on steamers transported to Dawson and onto Eagle, Alaska
#38: Raft of Fuelood, transported to Dawson - Little Sam at Fort Selkirk 1947
#39: Record - 1949 Timber Inspection - Whitehorse
#40: Old Resource Management Districts Map
#41: Current Resource Management Districts Map (included as Overhead # S-41)
#42: Polygons of logging zones created for each District (included as Overhead #S-42)
#43: Cordwood Comparisons 1899-1970 (included as Overhead #S-43)
#44: Field Survey - Yukon River - Fort Selkirk - 1992
#45: Field Survey - Yukon River - Regeneration of Islands - 1992
#46: Field Survey - Yukon River - Density of Spruce Regeneration - Sparse

#47: Field Survey - Yukon River - Density of Spruce Regeneration - Dense
#48: Field Survey - Stewart River - Steamboat wood camp - control burned in 1970's to encourage regeneration
#49: Field Survey - Stewart River - Steamboat wood camp - dense regrowth of spruce due to burning
#50: Field Survey - Stewart River - old millsite - General Enterprises logging operation - mid 1960's
#51: Field Survey - Stewart River - cutting area adjacent to old millsite - example of selective cutting

DESCRIPTION OF OVERHEADS

#1: Early Roads and Trails - Dalton Trail
#S-9: Slide#9 Whitehorse-Dawson Map -showing settlements & camps along Yukon River from Southern Lakes to Dawson (included as Overhead # S-9)
#2: Yukon River - Steamer/Logging Activities -Tagish to Carmacks
#3: Yukon River - Steamer Logging Activities -Carmacks-Henderson Creek (Dawson District)
#4: Yukon River - Steamer/Logging Activities -Excelsior Creek- Boundary of Alaska (Dawson District)
#5: Loading Wood on Sternwheelers
#6: Old Winter Road - Whitehorse to Dawson
#S-18: Slide#18 Dawson Goldfields - Klondike Mines Railroad - Yukon Ditch (included as Overhead #S-18)
#7: Yukon Ditch Flume - 1907
#8: Yukon Ditch Project in Dawson District
#S-19: Slide#19 Government Fuelwood Report - 1909-1910 (included as Overhead #S-19)
#9: Menard's woodpile - Cut in 1910, 5 miles above Minto on the Yukon River
#10: Buzz Saw Jimmy on his original Yukon saw- Whitehorse Waterfront
#S-30: Slide#30 Alaska Highway and Canol Projects 1942-1945 - Overview Map (included as Overhead #S-30)
#11: Sawmills for the construction of the Alaska Highway- 1943 Watson Lake to Whitehorse
#12: 1943 Sawmill & Logging Operations - Alaska Highway
#S-36: Slide #36: Description of bridges - stringers used (included as Overhead #S-36)
#13: Territorial Timber Regulations - 1954 & 1962
#S-41: Slide#41: Current Resource Management Districts Map (included as Overhead # S-41)
#S-42: Slide#42: Polygons of logging zones created for each District (included as Overhead #S-42)
#14: Database - All District/Polygon Summary - Transportation Activities
#15: Database - All District Summary - General Activities
#16: Database - All Districts - Annual Summary - General Activities
#17: Database - All District Summary - Commercial Timber Berths 1898-1913
#18: Database - All District Summary - Commercial Timber Berths 1947-1970
#19: Database - Annual Reports - General Activities
#20: Database - Annual Reports - Commercial Activities
#S-43: Slide #43: Cordwood Comparisons 1899-1970 (included as Overhead #S-43)
#21: Cordwood Comparison 1899-1970

Figure 1



Granville
Mayo L.
Gordon
Mayo
Fraser Falls
Stewart
M'Question
Stewart P.O.
Telegraph Station
Coffee Creek
Selwyn P.O.
Telegraph Line
Pelly
Canyon
Pelly
River
Fort Selkirk P.O.
Minto
Y
U
K
O
N
Yukon Crossing
Five Finger Rapid
Carmack P.O.
Little Salmon
Big Salmon
Montague
Braeburn
Hootalinkwa
Lower Laberge
L. Laberge
Kynocks
Little River
Dalton Trail
R
A
N
G
E
Canyon
Whitehorse and Kluane Road
Mendenhall Landing
Champagne Landing
WHITEHORSE
Dugdale
Clinton
Cowley
Robinson
De Wette
Lorne
Tagish
Cariboo
Dalton Post

FIGURE 2: YUKON RIVER ROUTE TO DAWSON

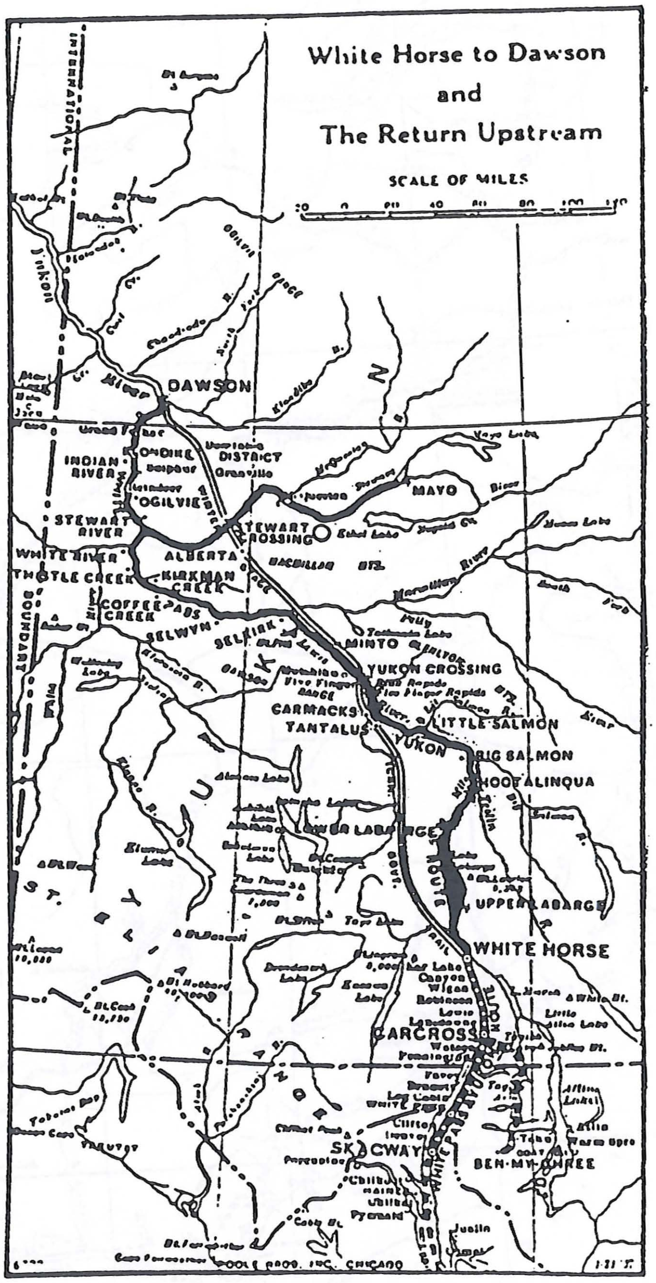


TABLE 3: YUKON RIVER - STEAMER/LOGGING ACTIVITIES

Fig. No. Polygon	Name	Steamer Stop	Wood Camp	Cabins	NWMP Post	Telegraph Station	Post Office
TAGISH DISTRICT							
12E	Taku Arm		*				
13F	Bennett - Lake Bennett	*	*	*	*	*	
13E	Carcross - Nares Lake	*	*	*			*
13A	Tagish - Tagish Lake	*	*	*		*	
13D	Conrad - Windy Arm	*	*	*			
15A	Marsh Lake	*	*				
16A	Canyon City	*					
LABERGE DISTRICT							
17B	Whitehorse - Mile 0	*	*	*	*	*	*
17B	Croucher Creek		*				
17B	Clutte	*	*				
17B	Takhini River	*	*				
17B	Raymonds Island	*	*				
17C	Upper Laberge	*	*		*		
18C	Laberge Indian Village		*	*			
18C	Laurier Creek		*				
20A	Lower Laberge	*	*	*	*	*	*
20B	Ironside & Co. Woodyard		*				
20B	Burn's Woodyard		*				
20B	Henderson's Woodyard		*				
20B	Robb's Woodyard		*				
20B	Stephenson's Woodyard		*				
20B	Johnson's Woodyard		*				
20B	Robb's Woodyard		*				
20B	17 Mile Woodyard		*				
20B	Tanana Reef		*				
20B	Stephanson's Woodyard No.3		*				
20B	Murcheson's Woodyard		*				
20B	Littles and Co. Woodyard		*				
20B	Saint's Woodyard		*				
20B	Cape Horn		*				
20B	Hootalingua - Mile 90	*	*	*	*	*	*
20C	Teslin River		*				
20D	Bayer's Camp # 1		*				
20D	Cassiar Bar - Mile 117				*		
21A	Big Salmon - Mile 133		*	*	*	*	*
21A	Big Salmon River		*				
CARMACKS DISTRICT							
35A	Dutch Bluff		*				
35A	Byer/Eric's Woodcamp- Mi 139		*	*			
35A	Claire Creek		*	*			
35A	Twin Creeks		*	*			
35A	Little Salmon		*	*			
37A	Lakeview	*	*				
37A	Lepage's Woodcamp	*	*				
37A	Mooreside Bend		*				
37A	Myer's Bluff		*				
39A	Tantalus Butte Coal Mine						
39A	Carmacks - Mile 202	*	*	*			*

TABLE 3: YUKON RIVER - STEAMER/LOGGING ACTIVITIES

Fig. No. Polygon	Name	Steamer Stop	Wood Camp	Cabins	NWMP Post	Telegraph Station	Post Office
CARMACKS DISTRICT							
39A	Carmacks - Mi 202	*	*	*			*
39C	Meyer's Roadhouse		*	*			
39C	Lepage's Woodcamp #1		*				
39B	Lepage's Woodcamp #2	*	*				
39B	Five Finger Coal Mine		*				
39C	Kellyville	*	*	*			
39C	Five Finger Rapids	*					
39B	Tatchun Creek		*				
39C	Yukon Crossing-Mi 236	*	*	*		*	
39C	Merrice Creek		*	*			
39C	Williams Creek		*	*			
39C	Hoochekoo Creek		*				
39C	Obrien's Woodcamp		*				
39B	McCabe Creek		*				
40B	Minto - Mi 258	*	*		*	*	
40B	Tom's Cabin		*	*			
40D	Big Creek		*				
40B	Devil's Crossing		*				
40D	Hell's Gate		*				
40D	Wolverine Creek		*				
40B	Slaughterhouse Slough	*	*				
40E	Pelly River		*				
40D	Fort Selkirk -Mi 282	*	*	*	*	*	*
41A	Ralston's Woodyard #1		*				
41A	Ralston's Woodyard #2		*				
41A	Pilot Island		*				
41A	ABC Roadhouse	*	*	*			
41A	Cripple Creek		*				
DAWSON DISTRICT							
54A	Mensies Woodcamp		*				
54A	Selwyn Station-Mi 317	*	*	*			*
55A	Isaac Creek		*	*			
55A	Caring Woodyard		*				
55A	Britannia Creek		*	*			
55A	Britannia Island		*				
55A	Ballarat Creek		*	*			
55A	Coffee Creek	*	*	*		*	
55A	Halfway Island		*				
55A	Kirkman Creek-Mi 362		*	*			*
56A	Independence Creek		*				
56A	Carlisle Creek		*	*			
56A	Los Angeles Creek		*				
56A	Thistle Creek	*	*	*			*
56A	Sawmill Island		*				
56A	Oneil's Landing		*	*			
56B	White River		*				
56A	Draken's Woodcamp		*				
57A	Stewart Island - Mi 390	*	*	*		*	*
57B	Henderson Creek		*				

TABLE 3: YUKON RIVER - STEAMER/LOGGING ACTIVITIES

Fig. No. Polygon	Name	Steamer Stop	Wood Camp	Cabins	NWMP Post	Telegraph Station	Post Office
DAWSON DISTRICT							
59A	Excelsior Creek		*				
59A	Rosebute Creek		*				
59A	Oglivie Island		*		*	*	
59B	60 Mile River		*				
59A	Reindeer Creek		*				
60A	Mecham Creek		*	*			
60A	Indian River		*	*			
60A	Galena Creek		*				
60A	Caribou Creek		*				
60A	Swede Creek		*	*			
60A	Hatchet Island		*				
60A	Dawson City - Mi 460		*	*	*	*	*
61A	Moosehide		*	*			
61A	Fort Reliance		*	*			
61A	16 Mile Creek		*	*			
61B	Chandindu River		*				
61A	15 Mile River		*				
61A	Cassiar Creek		*	*			
61A	Happy Creek		*				
62A	Forty Mile Settlement	*	*	*	*		
62B	Forty Mile River		*				
62A	Coal Creek		*				
62A	Cliff Creek		*				
62A	Fanning's Woodyard		*				
62A	Red Creek		*				
Boundary of. Alaska							

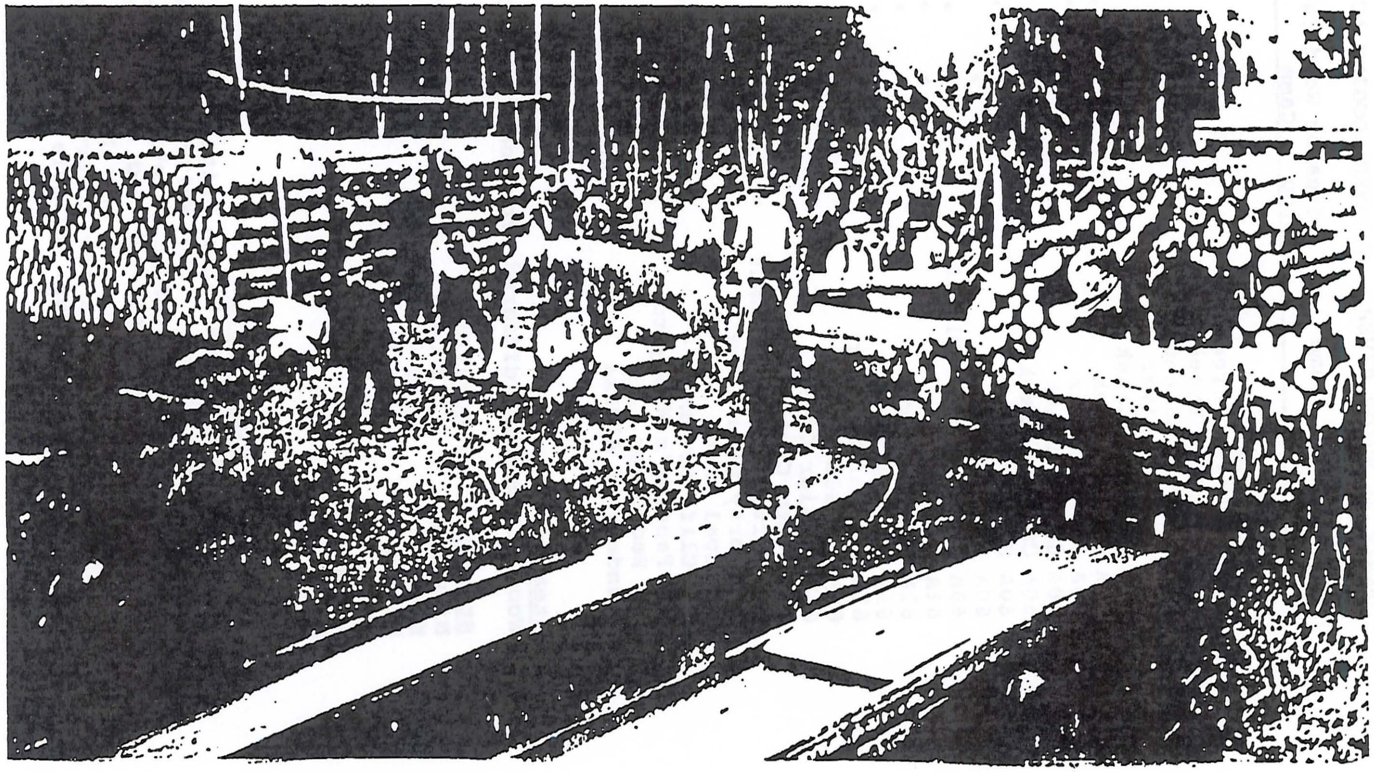
<u>Steamers</u>

Wood consumption differed from boat to boat. (19)

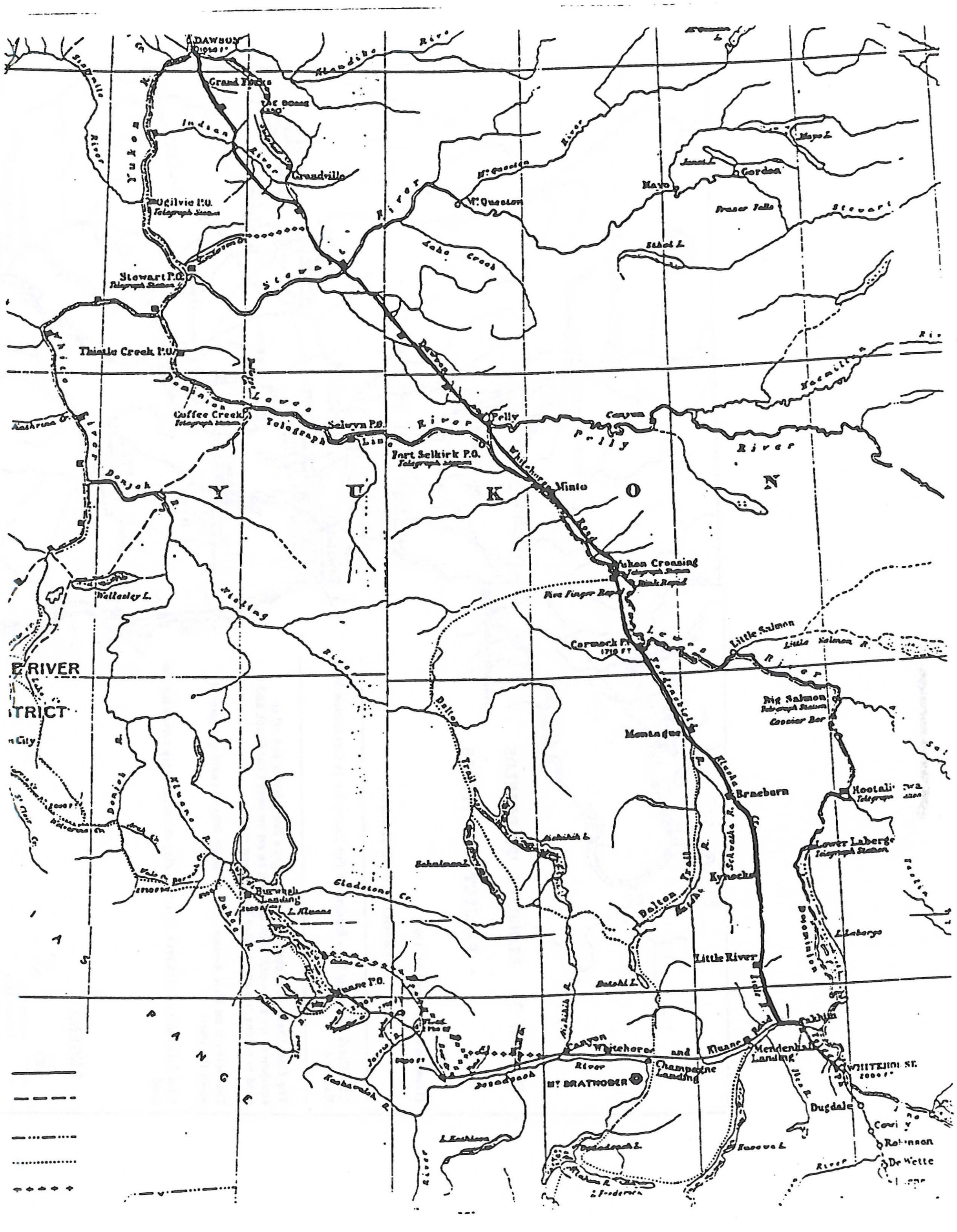
Steamer	Cords/Hour
Nisutlin	1/2 cord
Keno	5/8
Aksala	1 1/4
Casca	1 1/4
Whitehorse	1
Klondike	1

<u>Whitepass & Yukon Route :</u>

After the railroad was built, Whitehorse was the head of navigation for the Yukon River. The Whitepass & Yukon Route or British Navigation Company established offices, shipyards, and big docks for the boats. Records of wood use for each sternwheeler were documented, but due to the possibility of duplication with the permits and volumes in the government ledgers, have not been included in the databases. Example 1 indicates the type of records

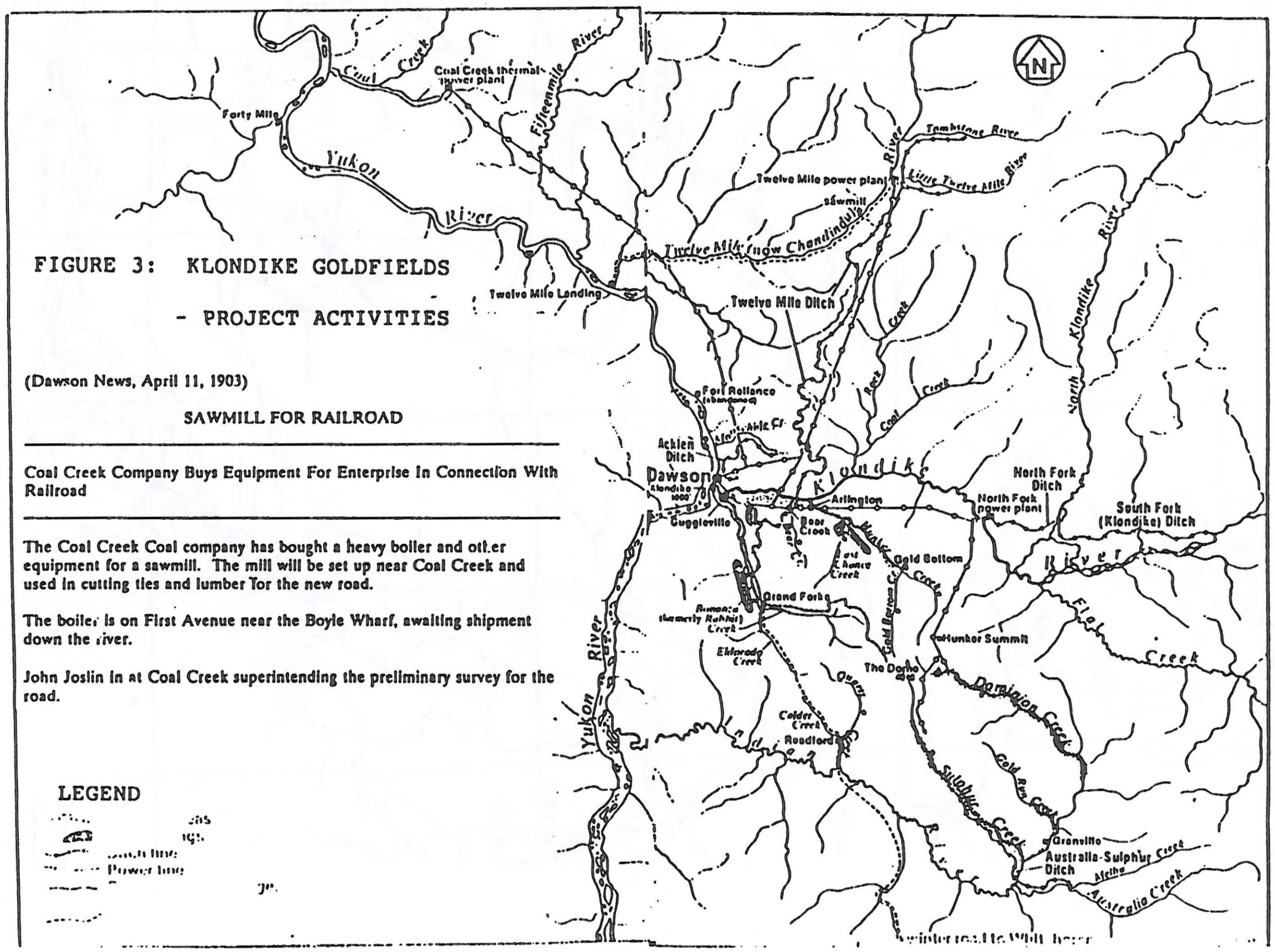


Loading fuel at a schedule stop on the Yukon River,



DAWSON
Grand Forks
Grandville
Ogilvie P.O.
Telegraph Station
Stewart P.O.
Telegraph Station
Thistle Creek P.O.
Coffee Creek
Selwyn P.O.
Fort Selkirk P.O.
Pelly
Minto
Yukon Crossing
Five Finger Rapid
Carmack
Little Salmon
Big Salmon
Montague
Braeburn
Kynock
Hootalinqua
Lower Laberge
Telegraph Station
Little River
Takhini
Mendenhall Landing
WHITEHORSE
Champagne Landing
Dugdale
Robinson
De Wette
Mayo
Gordon
Mc Question
Burwash Landing
Kluane P.O.
Y
U
K
O
N
RIVER
TRICT
Wellesley L.
Dalton Trail
Whitehorse and Kluane Road
MT BRATNOBER

FIGURE 3: KLONDIKE GOLDFIELDS - PROJECT ACTIVITIES



(Dawson News, April 11, 1903)

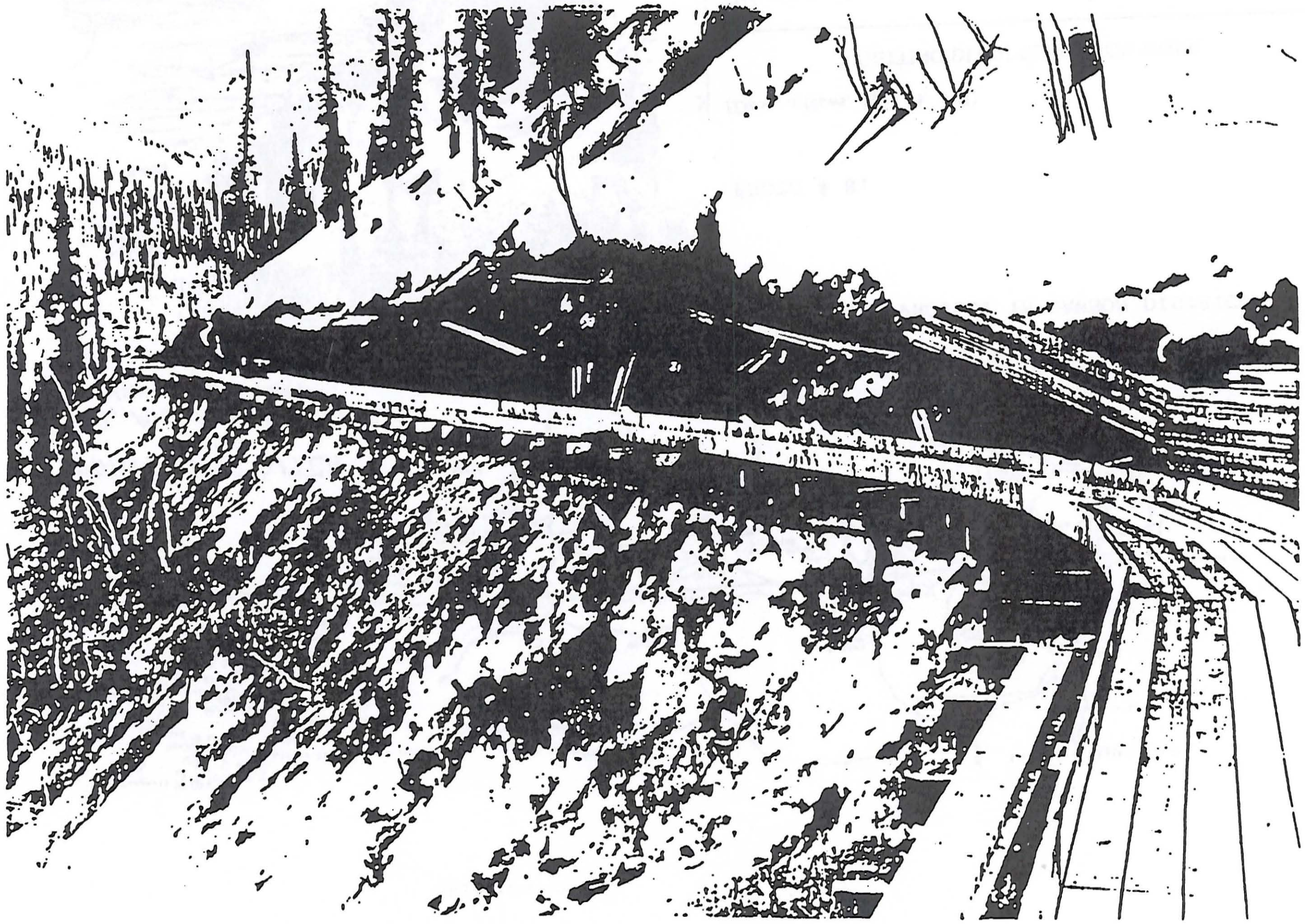
SAWMILL FOR RAILROAD

Coal Creek Company Buys Equipment For Enterprise In Connection With Railroad

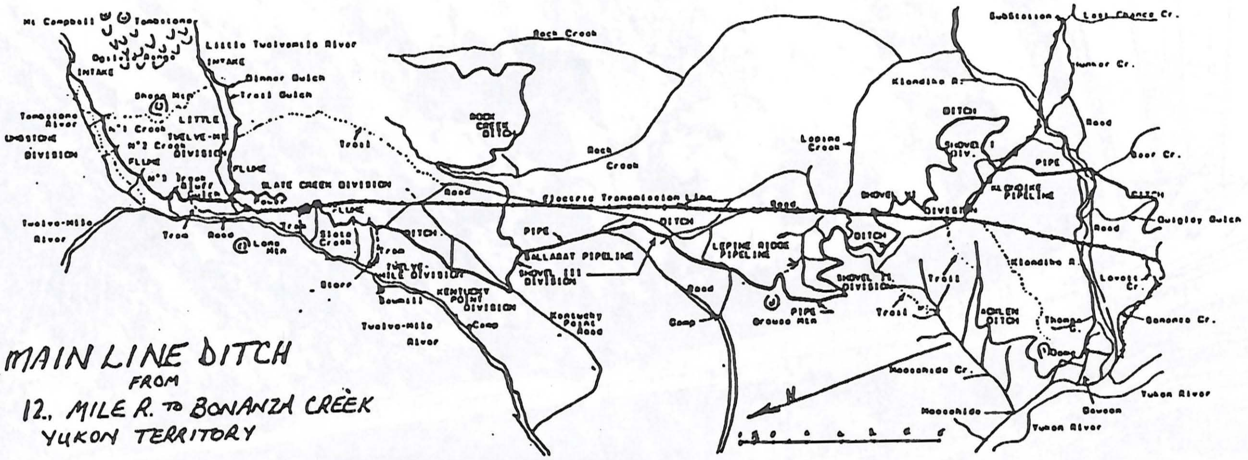
The Coal Creek Coal company has bought a heavy boiler and other equipment for a sawmill. The mill will be set up near Coal Creek and used in cutting ties and lumber for the new road.

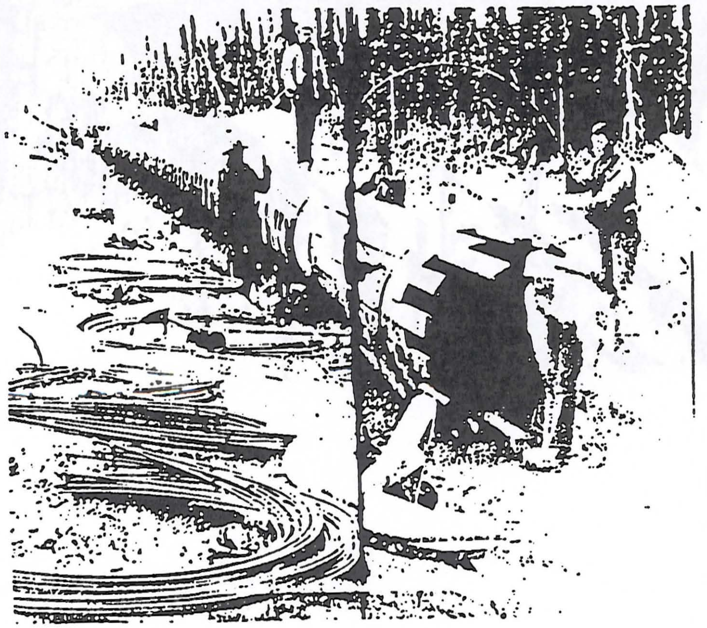
The boiler is on First Avenue near the Boyle Wharf, awaiting shipment down the river.

John Joslin in at Coal Creek superintending the preliminary survey for the road.



The Yukon Ditch under construction in the spring of 1907





YUKON DITCH PROJECT IN DAWSON DISTRICT

PHOTO # 8:

(Dawson News, April 14, 1903)

GETTING DITCH READY FOR WORK

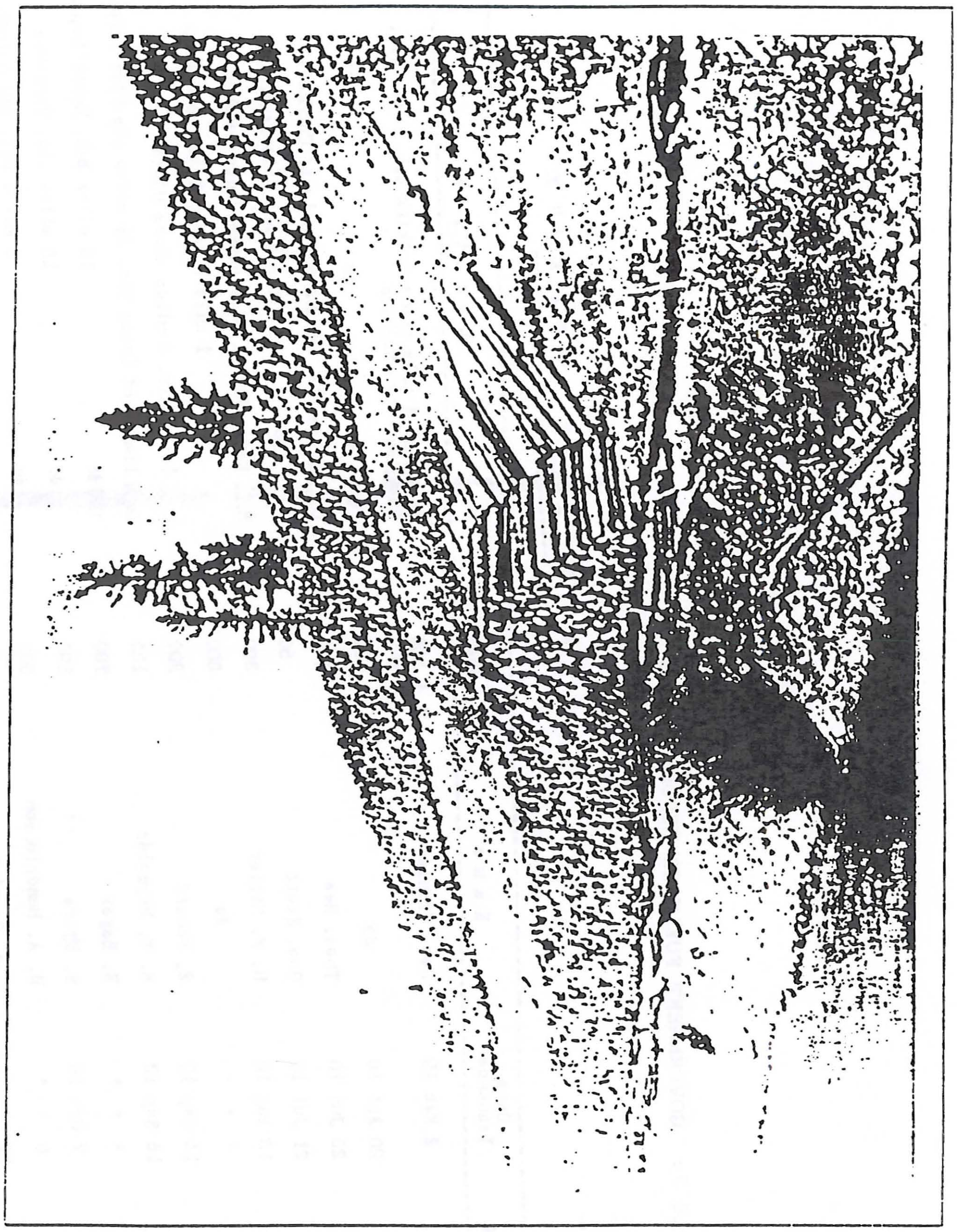
(3rd paragraph)

Recent arrivals from the creek state that the activity in wood-hauling shows no diminution. The claim owners are bending their efforts to getting a good supply of wood for the summer. Wood is scarce on upper Dominion and the miners of that creek are drawing on the timber of the lower stream. A large number of men are engaged in hauling wood. Many teams are at work.

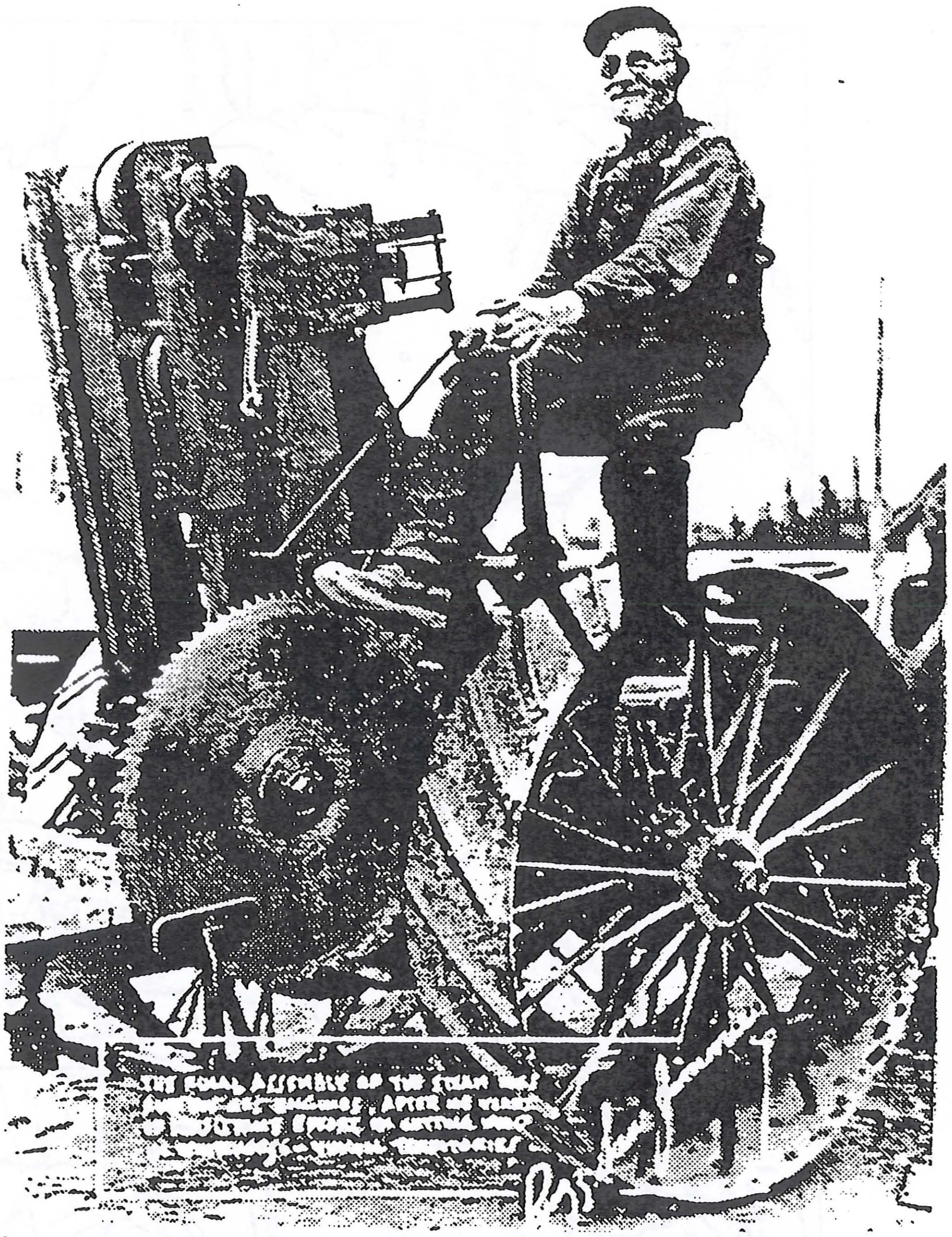
EXAMPLE 7: GOVERNMENT FUELWOOD REPORT - 1909 -1910

YUKON ABOVE SELKIRK

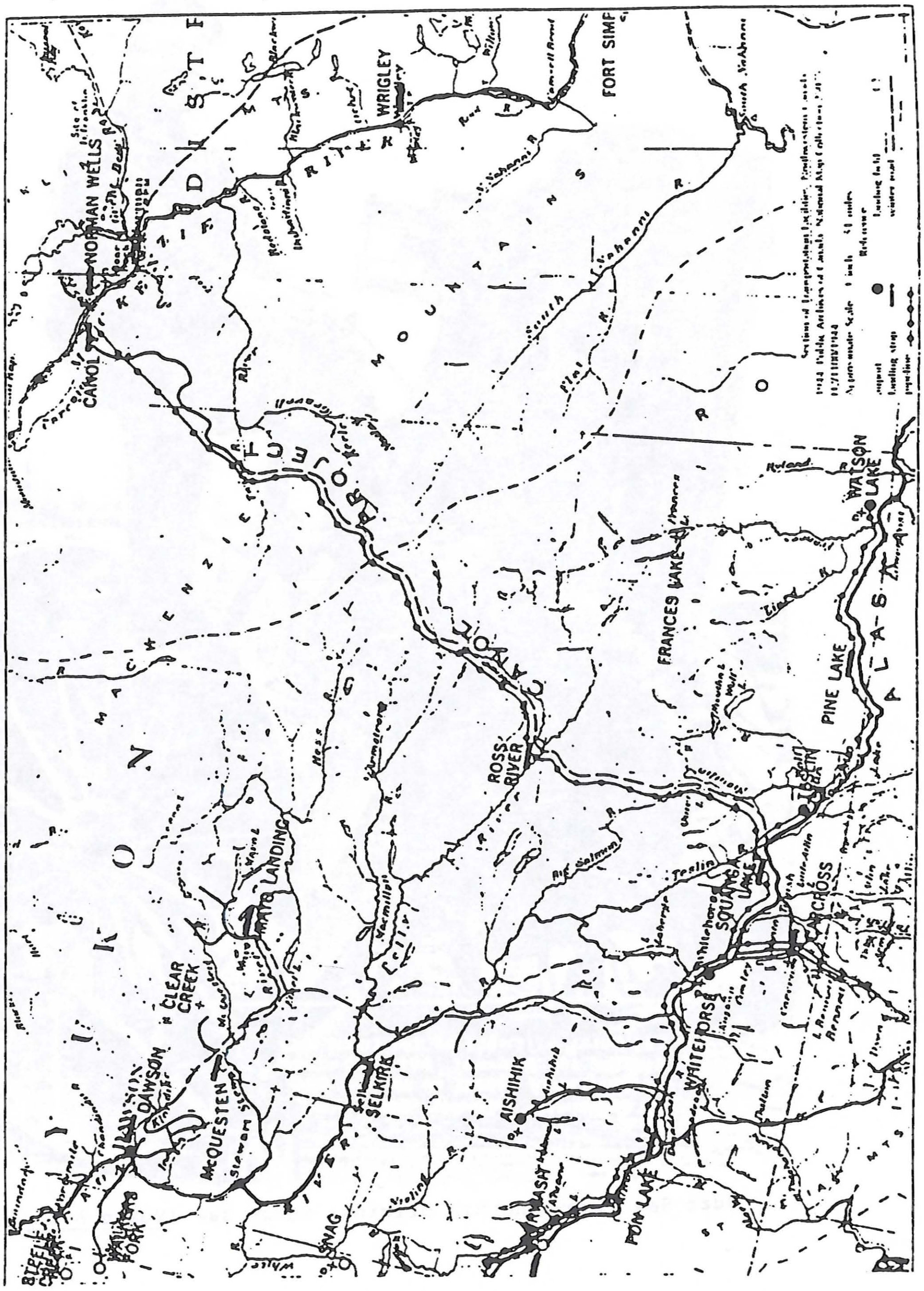
Permit	Date Issuance	Name	Quantity	Location
1229	2 Feb 10	Geo. Granier	200 200	On Island 1 mile above Selkirk L.L. Lewes Riv. 29 miles above Selkirk
2751	20 Apl 10	do	50	do do
2772	23 Jun 10	Thos. Bee	100	L.L. Lewes Riv. in the vicinity of Carmacks
2776	21 Jul 10	Geo. Scott	50	do 15 miles below Lake Labarge
2785	13 Aug 10	H. F. Miller	300	R.L. Lewes Riv. 1 mile above Minto Roadhouse
2786	" " "	do	200	do 1 mile below McCabes wood camp
2797	15 Sep 10	E. Menard	200	L.L. Lewes Riv. 5 miles above Minto
2798	16 Sep 10	E. W. Reynolds	125	Both limits of Lewes Riv. 3½ miles abv.Five Finger
2799	" " "	R. Bayer	700	do 18 miles bel. Hootalinqua
2812	7 Oct 10	S. Myors	190	do 15 miles abv. Carmacks
2813	8 " "	B. A. Hendrickson	300	do 8 miles bel. Big Salmon
2814	12 " "	Geo. Granier	200	L.L. Lewes Riv. 7 miles above Minto
2777	21 Jul 10	B. A. Hendrickson	403	do about 10 miles below Big Salmon Riv
1248	14 Apl 10	Geo. Granier	200	do 7 miles above Minto
1204	6 Oct 09	R. Bayer	600	[illegible]. 300 cds. 21 miles bel. Hootalinqua & 300 cds. 1[illegible] miles bel. Hootalinqua on both limits.
1168	22 Jun 09	Taylor & Drury	200	R.L. Little Salmon one mile up on same

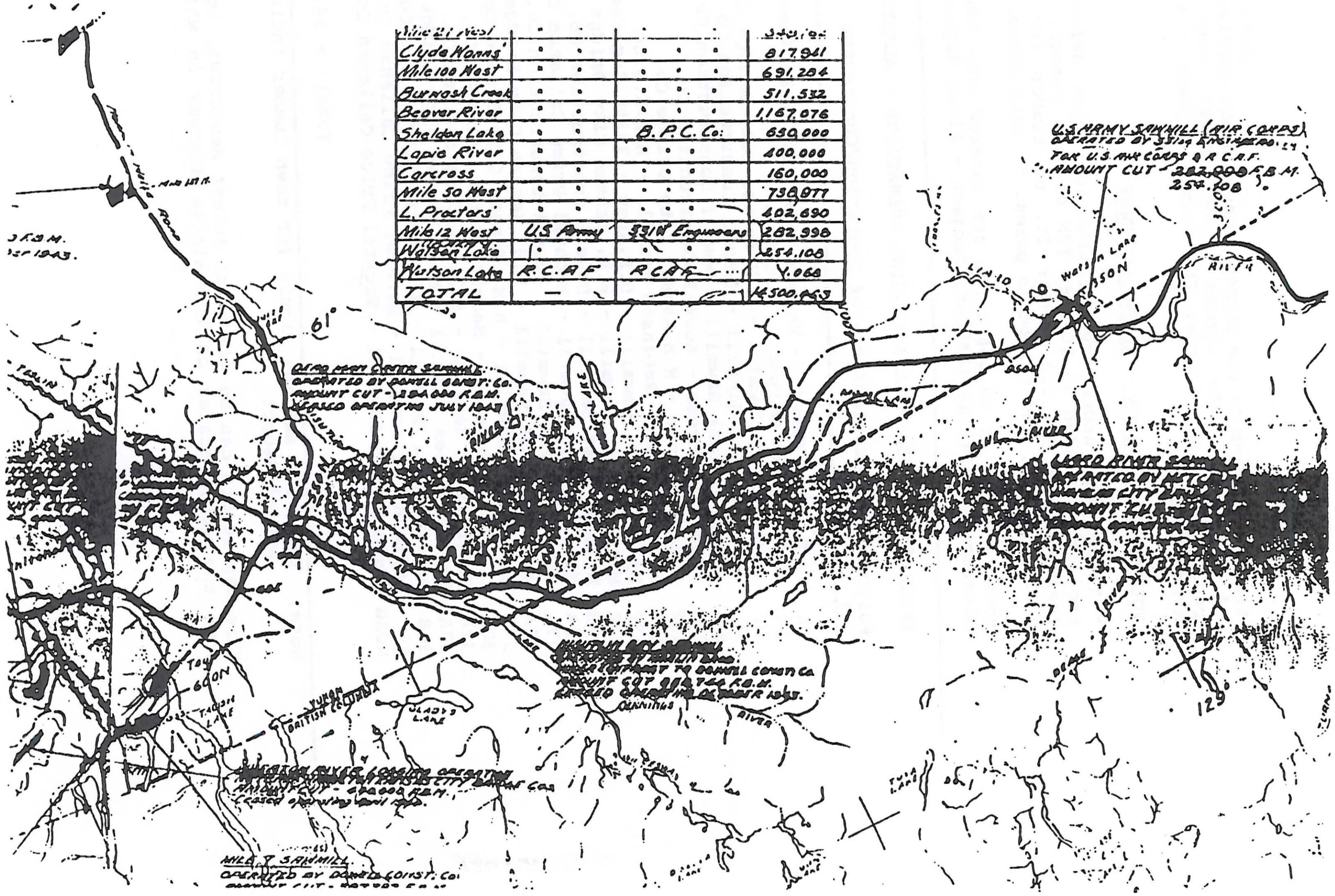


Rows of Cordwood Near Minto, Cut in 1910.



1 · Buzz Saw Jimmy and his original Yukon saw (Yukon Archives).


NORMAN WELLS
CANOL
WRIGLEY
FORT SIMP
WATSON LAKE
PINE LAKE
FRANCES LAKE
ROSS RIVER
MAYO LANDING
CLEAR CREEK
DAWSON
McQUESTEN
SELKIRK
AISHIHIK
WHITEHORSE
SNAG
SQUANGA LAKE
CANOL PROJECT
MACKENZIE MOUNTAINS
YUKON


Clyde Wonns 817,941
Mile 100 West 691,284
Burwash Creek 511,532
Beaver River 1,167,076
Sheldon Lake B.P.C. Co. 650,000
Lapie River 400,000
Carcross 160,000
Mile 50 West 738,077
L. Proctors 402,690
Mile 12 West U.S. Army 531st Engineers 282,998
Watson Lake 254,108
Watson Lake R.C.A.F. R.C.A.F. 4,068
TOTAL 14,500,463
U.S. ARMY SAWMILL (AIR CORPS)
FOR U.S. AIR CORPS & R.C.A.F.
AMOUNT CUT - 282,998 F.B.M.
254,108
OPERATED BY DOWELL CONST. Co.
CEASED OPERATING JULY 1943
MILE 7 SAWMILL
OPERATED BY DOWELL CONST. Co.
YUKON
BRITISH COLUMBIA
RIVER
61°
129°

(Most of the original temporary spans on the pioneer road did not survive the spring thaw of 1943, and the summer floods swept away many of their replacements.)" Source: The Alaska Highway - 40th Symposium - Kenneth Coates

VOLUME INFORMATION - ALASKA HIGHWAY

" Timber cut under free permits for joint defense construction projects included 14,500,463 FBM of sawn lumber, 49,356 cords of fuelwood and 618,123 limear ft. of timber for bridge piling, building logs, and telephone poles. " 1943 Annual Report

Note: A total of 49,356 cords are entered into the Annual Report database in 1943 as (PALCAN) Project - Alcan Highway.

TABLE 6: 1943 SAWMILL & LOGGING OPERATIONS - ALASKA HIGHWAY

Polygon #	Location/Name of Operation/Contractor	Amount of Sawn - FBM
1A	U.S. Army Sawmill- Watson Lake - 331st Engineers	254,108
1B	Watson Lake Airport - R.C.A.F.	1,068
1C	Liard River Sawmill - M.H.Kansas City Bridge Co.	167,067
7C	Nisutlin Bay Sawmill - Dowell Construction.Co.	858,744
8A	Deadman Creek Sawmill - Dowell Construction Co.	294,000
13B	Mile 7 Carcross - Dowell Construction Co.	383,382
13F	Wheaton River - M.H.Kansas City Bridge Co.	440,000
14B	Watson River - Robinson Sawmill - M.H.K.B.CO	1,801,361
17F	Mile 12 West Sawmill - U.S.Army - 331st Engineers	282,998
22A	Mile 27 West Sawmill - M.H. Kansas City Bridge Co.	348,762
22B	Mile 48 West Sawmill - Dowell Construction Co.	1,044,856
23A	Mile 50 West Sawmill - Bechtel Price Callahan Co.	738,977
27A	Mile 100 West Sawmill - Dowell Construction Co.	1,489,785
27A	Mile 100 West Sawmill - M.H. Kansas City Bridge Co.	691,284
27B	Clyde Wann Sawmill - M.H. Kansas City Bridge Co.	817,941
30A	L.Proctor Sawmill - Bechtel Price Callahan Co.	402,690
32A	Edith Creek Sawmill - Elliott Construction Co.	1,594,832
32A	Burwash Creek Sawmill - M.H. Kansas City Bridge Co.	511,532
34B	Beaver Creek Sawmill - M.H.Kansas City Bridge Co.	1,167,076
44C	Lapie River Sawmill - Bechtel Price Callahan Co.	400,000
ROSG	Sheldon Lake Sawmill - Bechtel Price Callahan Co.	650,000
	Total	= 14,500,463 FBM

Note: Total FBM matches figure for sawn lumber indicated in 1943 Annual Report

This map record can be viewed at Forest Resources, located across from the weigh scales on the Alaska Highway in Whitehorse.

EXAMPLE 3: DESCRIPTION OF ALASKA HIGHWAY BRIDGES - MILE 768-897

Mile 768.7	Lower Hazel Creek H-15 loading 24' roadway	3-21' p.t. spans, 15-6 x 20 stringers, 2 x 6 lam. deck.
777.0	Morley River H-20 loading 24' roadway 14'3" vert. clearance	1-160' through volmanized timber truss on conc. abuts, 9-6x22 stringers, 2 x 6 lam. deck, 2" plank wearing surface.
803.6	Nisutlin Bay H-15 loading 12' roadway	95-25' p.t. spans, 6-6x22 stringers, 4" plank deck.
813.1	Ten Mile Creek H-15 loading 24' roadway	1-21' framed trestle span, 15-6x20 stringers, 2 x 6 lam. deck.
816.8	Lone Tree Creek H-15 loading 24' roadway	1-21' framed trestle span, 15-6x20 stringers, 2 x 6 lam. deck.
822.5	Deadman Creek H-20 loading 35' roadway	1-60' I-beam on rein. conc. abutments, 2 x 8 lam. deck.
825.0	Army 21 Bridge H-15 loading 24' roadway	1-21' framed trestle span, 15-6x20 stringers, 2 x 6 lam. deck.
836.0	Teslin River H-20 loading 24' roadway Under construction	2-80' I-beams, 2-100' steel deck trusses, 2-220' anchor and 1-260' main span cant. deck truss, 2-200' steel deck trusses, 1-80' I-beam; on rein. conc. abuts. and piers, conc. deck and curbs.
849.0	Johns' River H-15 loading 24' roadway	3-19' pile trestle spans, 15-6x18 stringers, 2 x 6 lam. deck.
872.2	Judas Creek H-15 loading 20' roadway	4-19' pile trestle spans, 2 x 6 lam. deck.
883.8	Glacier #1 H-15 loading 24' roadway	1-21' pile trestle span, 15-6x20 stringers, 2 x 6 lam. deck.
887.6	Glacier #2 H-15 loading 24' roadway	1-21' pile trestle span, 15-6x20 stringers, 2 x 6 lam. deck.
890.3	McClintock River H-15 loading 12' roadway	15-21' pile trestle spans, 6-6x22 stringers, 2 x 6 lam. deck.
893.4	Glacier #3 H-15 loading 24' roadway	1-21' pile trestle span, 15-6x20 stringers, 2 x 6 lam. deck.
897.6	Lewes River H-15 loading 12' roadway	21-25' pile trestle spans, 6-6x22 stringers, transverse 4" plank deck, with 4" plank wearing surface, on 45 degree skew.

TABLE 12: TERRITORIAL TIMBER REGULATIONS - DUES

Territorial Timber Regulations - P.C. 1954-604

Schedule of Dues

PART I

1. Fuelwood:
   - (a) fire-killed or dry .... per cord 50 cents
   - (b) all green timber .... per cord $1.00

PART II

2. Round timber including poles, piling, building logs, mine timber, cribbing, fence posts, telegraph and telephone poles:
   - (a) not exceeding 5 inches at butt, inside the bark ...... per lin. ft. ½ cent
   - (b) over 5 inches and not exceeding 7 inches at butt, inside the bark .... per lin. ft. 1 cent
   - (c) over 7 inches and not exceeding 9 inches at butt, inside the bark .... per lin. ft. 2 cents
   - (d) over 9 inches at butt, inside the bark .... per lin. ft. 3 cents
3. Sawlogs:
   - (a) poplar .... per M. FBM $2.00
   - (b) other species .... per M. FBM $3.00
4. Railway ties:
   - (a) 8 feet in length .... each 15 cents
   - (b) each lineal foot over 8 ft. .. per lin. ft. 2 cents
5. Slabs and edgings if disposed of by sale .... per cord 40 cents
6. All other products of the forest not otherwise enumerated ...... 15% ad valorem at point of shipment.

Territorial Timber Regulations - P.C. 1962-1042

Schedule

Dues

1. Fuelwood and round timber not more than 8 feet in length
   - (1) Fire-killed or dry, per cord .... 25 cents
   - (2) All green timber, per cord .... 50 cents
2. Round timber 8 feet and over in length (poles, piling, building logs, mine timber, cribbing, fenceposts, telegraph and telephone poles) per piece

Top diameter inside bark	*Length* A 8 - 16'	B 17 - 24'	C 25 - 32'	D 33 - 40'
up to 5"	1¢	2¢	3½¢	5½¢
5.1 to 6"	1½¢	3¢	4½¢	7¢
6.1 to 7"	2¢	3½¢	5½¢	8½¢
7.1 to 8"	2½¢	4½¢	7½¢	10½¢
8.1 to 9"	3¢	6¢	9¢	12¢

Round timber larger or longer than listed above shall be scaled as sawlogs.

3. Sawlogs, all species, per M. FBM $1.00
4. Railway ties, each .... .02
5. Slabs and edgings, per cord .... .25

FIGURE 1: DISTRICT BOUNDARIES AND FIGURE NUMBERS

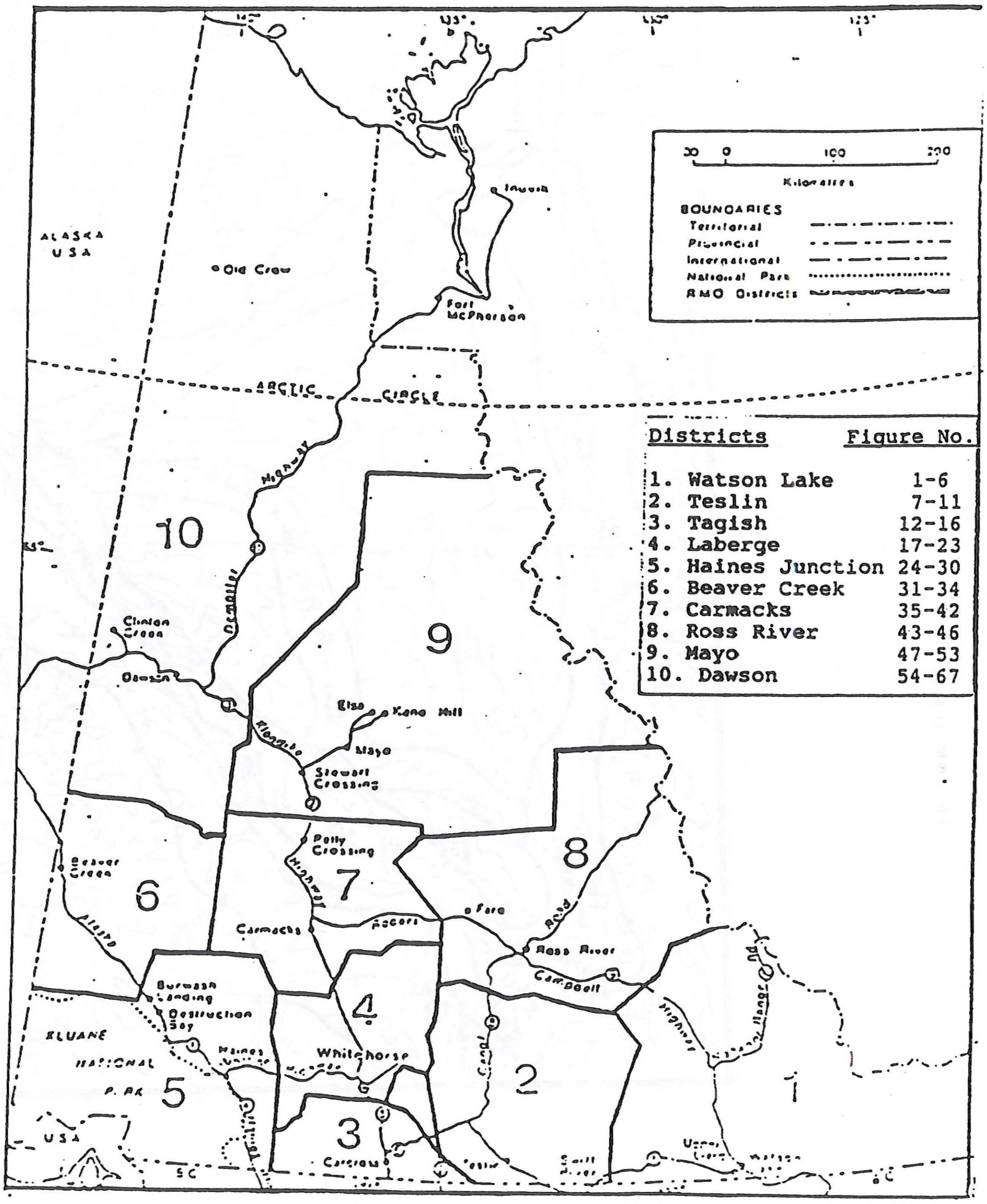


FIGURE 40. McCABE CREEK - FORT SELKIRK - PELLY CROSSING

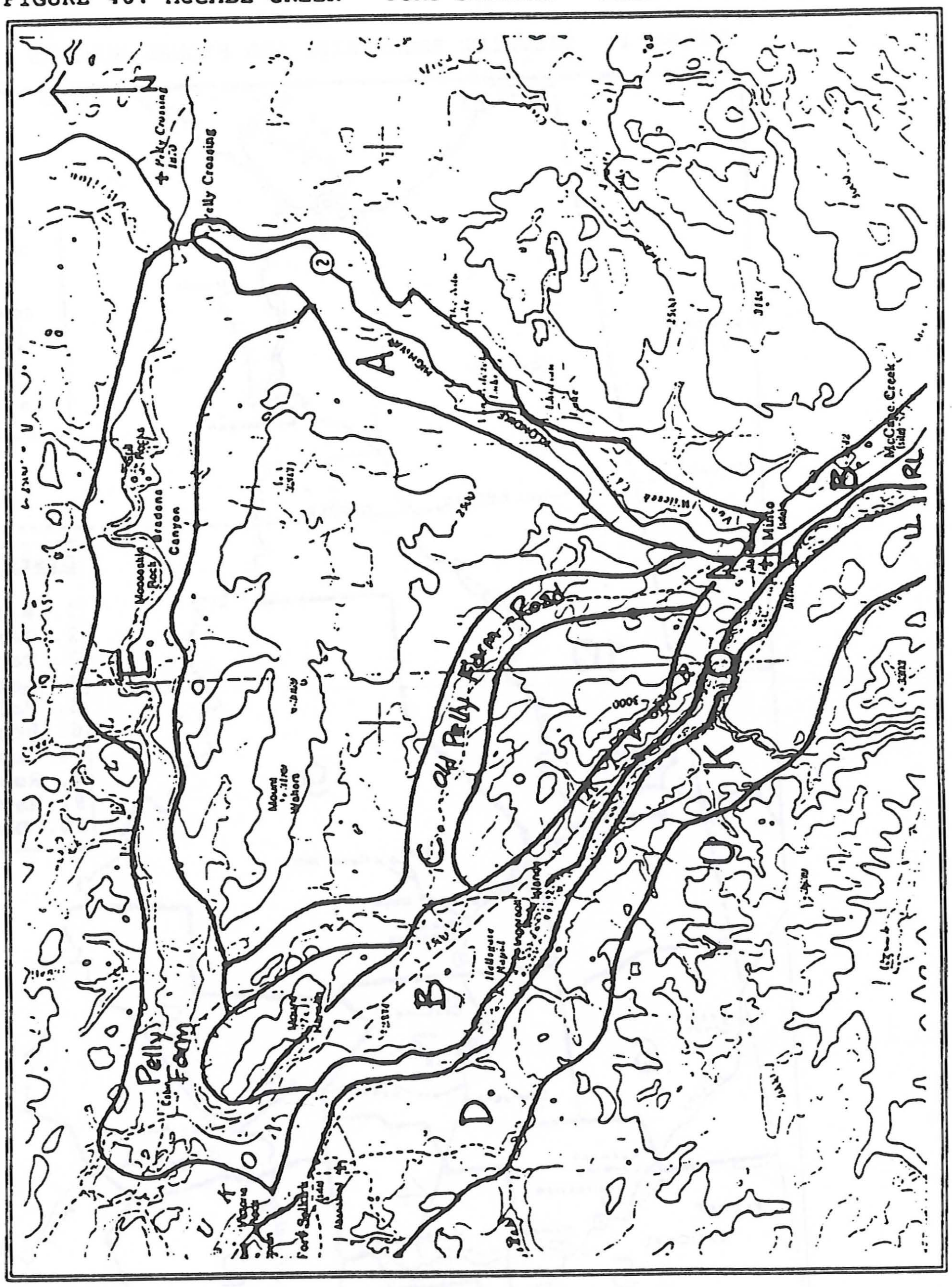


TABLE 3: ALL DISTRICT/POLYGON SUMMARY - TRANSPORTATION ACTIVITIES

DISTRICT	POLYGON	CORDS	TOTALS	DISTRICT	POLYGON	CORDS	TOTALS
TESLIN	08A	30	= 30	MAYO	53A	1257	
TAGISH	15A	25			MAYG	20	= 1277
	TAG	9338	= 9363	DAWSON	54A	1474	
LABERGE	20B	150			55A	1264	
	20D	1475			56A	592	
	21A	957			56B	1082	
	YRBS	1600			59A	1370	
	YRLA	5202			59B	823	
	LABG	406	= 9790		60A	5486	
CARMACKS					60B	60	
	35A	2908			60D	155	
	37B	1015			61A	3740	
	39A	215			61D	83	
	39B/C	125			61E	88	
	39C	600			62B	60	
	40B	500			64A	8238	
	40C	100			65B	212	
	40D	450			DA40	1732	
	40E	978			DAG	85028	
	41A	125			DAGF	365	
	YRCA	38041			KRDA	17061	
	YRSK	17926	= 62983		KRG	3633	
	PRG	9621	= 9621		YRDA	42120	
			= 72604		YRDB	10649	
					YRMH	1834	
STEWART R.	SRG	27478	= 27478		YROK	477	= 187626

TRANSPORTATION TOTAL = 308,168 CORDS

CARMACKS
The Carmacks region, including from Fort Selkirk to Little Salmon on the Yukon River and the Pelly River, had the second highest amount of wood harvested, which was used mainly by steamers. The Five Finger and Tantalus Butte coal mine also required timber. Separate polygons were created for volumes where location was not specified but known to be within the general area, ie. along the particular section of the river. The Yukon River, in the area from Carmacks east towards Little Salmon (YRCA), and the area north of Carmacks near Fort Selkirk (YRSK) are represented. The Pelly River (PRG) was also a separate polygon as locations were not specified. The upper portion of this river falls within the Ross River District, but for this report, the Pelly River volumes have been included in the Carmacks District.

MAYO
Records for Mayo were limited for this database, a volume of 1277 cords was harvested in 1913, primarily in the Clear Creek Mining

2.2 GENERAL ACTIVITIES

General activities are covered from 1947 - 1970 for each of the ten Logging Districts and the Yukon General category. The Yukon General category includes records where no locations were specified. This includes most of the entries between 1950 - 53, which were indicated as "limit numbers" with no location description. After 1953, location descriptions improved and volumes were entered into the individual figure/polygons and district general categories.

2.2.1 ALL DISTRICT SUMMARY - GENERAL ACTIVITIES

Volumes for General Activities for each district are summarized in Table 6, including cordwood, logs, and manufactured lumber. A total of 4779 records were entered into the database representing the entire Territory. This does not include volumes specified as commercial.

TABLE 6: ALL DISTRICT SUMMARY - GENERAL ACTIVITIES

DISTRICT	CORDS	DRY	GREEN	SL_FBM	LOGS	BLDLOG	BLD_LF	PIECES	PCS_FBM	PCS_LF
WATSON L	101	1922	5566	0	800	0	0	2583	2209235	162271
TESLIN	0	2736	1824	0	0	0	800	993	169000	47980
TAGISH	164	4899	4663	0	732	0	0	44844	4105325	34074
LABERGE	826	20364	2492	0	897	0	580	17292	493000	75734
HAINES J	0	3515	190	0	0	100	0	945	64750	31915
BEAVERCK	0	1426	357	0	0	0	1200	2913	294955	23016
CARMACKS	100	7035	158	0	0	75	0	29656	1440300	19305
ROSS R.	0	705	10	0	0	0	0	4123	50000	0
MAYO	7552	14983	2389	20000	0	0	24024	206866	3444214	1218265
DAWSON	3070	8392	2061	0	15	0	0	12629	66185	26546
YGEN	12119	3131	2087	0	152	190	1360	2408	1264000	81568
TOTAL	23932	69108	22609	20000	2596	365	27964	325252	13600964	1720674

A total of 115,649 cords were cut from 1947 - 1970. The highest cordwood quantities were cut in the Mayo District (24924 cords) and in the Laberge District (23682 cords.) The majority of this was dry wood. The Watson Lake and Tagish Districts had the most green wood cut, probably due to less areas with dry wood available. In the Yukon General category, most cordwood harvested was not specified as dry or green.

The districts with the most manufactured lumber were the Mayo, Tagish, and Watson Lake Districts. In Mayo, much of the manufactured lumber was used for mining purposes; for stulls, cribbing, lagging and mining timbers for United Keno Hill Mines. Units of measurement varied in description, as Pieces, Pieces - FBM or Pieces - LF. In Tagish, the manufactured lumber included railroad ties and mining timbers. In Watson Lake, the use of the manufactured lumber was generally not specified.

__Total # of Entries/District__

Watson Lake	- 308	Beaver Creek	- 114
Teslin	- 286	Carmacks	- 292
Tagish	- 620	Ross River	- 26
Laberge	- 1281	Mayo	- 649
Haines Junction	- 161	Dawson	- 462
		Yukon General	- 580

Total Entries = 4779

2.2.2 ALL DISTRICTS - ANNUAL SUMMARY - GENERAL ACTIVITIES

In Table 7, the timber volumes cut annually for the ten logging districts and the Yukon General category from 1947 - 1970 are shown. The annual summary for the Yukon General category is presented seperately in Table 8. Detailed annual summaries for each logging district are presented in the individual district sections.

TABLE 7: ALL DISTRICTS - ANNUAL SUMMARY - GENERAL ACTIVITIES

YEAR	CORDS	DRY	GREEN	SL_FBM	LOGS	BLDLOG	BLD_LF	PIECES	PCS_FBM	PCS_LF
1947	845	523	228	0	0	0	0	0	0	0
1948	363	652	206	20000	0	0	0	0	0	0
1949	774	580	287	0	0	0	4260	0	0	0
1950	5906	1401	234	0	40	0	400	481	1264000	15300
1951	3233	1282	160	0	100	30	0	900	27010	70345
1952	4801	1485	606	0	0	100	0	1200	0	86958
1953	2129	1744	517	0	12	60	960	0	0	21244
1954	871	1931	1087	0	432	0	800	0	0	104654
1955	454	1725	871	0	0	0	1764	4000	31000	112338
1956	338	2312	1106	0	397	0	19780	500	12000	113990
1957	21	1928	1054	0	0	75	0	3500	95000	126572
1958	0	1793	834	0	0	0	0	7043	25000	11065
1959	18	2239	664	0	0	0	0	13200	10000	103943
1960	256	2391	3229	0	0	0	0	421	48000	347140
1961	30	2277	958	0	0	0	0	250	357707	248318
1962	150	4882	1028	0	0	0	0	12165	25000	65561
1963	0	3886	694	0	0	0	0	15354	105100	18930
1964	0	5755	903	0	580	0	0	11512	115575	30166
1965	15	5247	901	0	1020	0	0	33731	118125	1600
1966	400	4668	1635	0	0	0	0	46204	215765	3000
1967	413	4408	1986	0	15	0	0	20803	1144000	0
1968	1125	7474	978	0	0	0	0	65909	4405195	12800
1969	970	4869	1476	0	0	0	0	11258	2865670	202750
1970	820	3656	967	0	0	100	0	76821	2736817	24000
	23932	69108	22609	20000	2596	365	27964	325252	13600964	1720674

In 1947 - 1950, volumes harvested represented those of the Mayo District as these were the only available records for this period. This consisted primarily of cordwood with 20,000 FBM of sawlogs and 4260 LF of building logs harvested from 1947-49. In 1950,

2.3.1. COMMERCIAL BERTHS - 1898 - 1913

Most of the early timber berth information was from the document by Margaret Carter which reviewed berths from 1898 - 1903. (24) A partial list of timber berths for 1903 from this spurce is presented as Example 10 in Volume I. Activities included the production of fuelwood (Cords), lumber for boat building (BB), mining timbers (MT), and building materials etc. for community needs (Other). When known, the associated company was indicated. Abbreviations are listed in the database section 5.0 in Volume I. The period of operation is noted to the last date the berth was found in the records. Many berths were not documented in other sources and thus in many instances the end of operation is indicated as 1903. A Dawson report in 1913 listed several timber berths, which is presented as Example 8 in Volume I. Timber berths without specific locations along the Stewart and Yukon Rivers were grouped into a separate polygon. The number of timber berths in each district and the berths in the Yukon River General polygon are presented in Table 9A.

TABLE 9A:
ALL DISTRICT SUMMARY - COMMERCIAL TIMBER BERTHS 1898 -1913

DISTRICT	# OF BERTHS	DISTRICT	# OF BERTHS
Watson Lake	0	Beaver Creek	0
Teslin	2	Carmacks	21
Tagish	14	Ross River	0
Laberge	9	Mayo	4
Haines Junction	0	Dawson	55
Yukon River	17	Stewart River	14

COMMERCIAL BERTHS - YUKON RIVER GENERAL

POLY	BERTH	FROM	TO	ACTIVITY TYPE			COMPANY
YRG	023	1898	1903			OTHER	CYLCO
YRG	027	1898	1902	CORDS		OTHER	
YRG	049	1898	1903	CORDS			
YRG	060	1899	1903	CORDS		OTHER	CYLCO
YRG	061	1900	1901			OTHER	JLMDCO
YRG	062	1900	1903			OTHER	
YRG	063	1900	1903			OTHER	
YRG	084	1901	1903			OTHER	YSCO
YRG	088	1901	1910	CORDS			
YRG	099	1901	1903			OTHER	JLMDCO
YRG	104	1901	1903			OTHER	NATTCO
YRG	106	1901	1913	CORDS		OTHER	
YRG	107	1902	1902			OTHER	KMCO
YRG	108	1902	1910			OTHER	KMCO
YRG	109	1902	1903			OTHER	
YRG	123	1903	1913			OTHER	
YRG	127	1903	1913		MT	OTHER	

Timber berths on Lake Bennett and Windy Arm provided timber for boat construction. Most of the timber berths were located along the Yukon River to Dawson. Timber berths at Lower Laberge, along the Thirty Mile River, Big Salmon, Fort Selkirk, Sixty Mile, Forty Mile and Klondike River areas provided wood for steamers, building materials and mining activities.

The number of timber berths per polygon are discussed in the individual district sections in 3.0. Timber berths in the Stewart River General polygon are presented in the Dawson District.

2.3.2 COMMERCIAL BERTHS - 1947 - 1970

A majority of the 246 berths recorded between 1947 - 1970 were located in the Mayo district. Tagish, Carmacks and Watson Lake districts had between 24-31 berths, located along the rivers and highways. The unit of volumes harvested and the type of activity are indicated in the database file [BerthCS], which is presented in Appendix 4. Abbreviations are explained in section 5.0 of Volume I.

In many cases, the amount of timber harvested was not clearly stated and, for this reason, volumes were not included in the commercial databases. The commercial timber berths are described in the individual logging district sections. Total numbers of berths per district are presented in Table 9B.

TABLE 9B: ALL DISTRICT SUMMARY - COMMERCIAL TIMBER BERTHS 1947-1970

DISTRICT	# OF BERTHS	DISTRICT	# OF BERTHS
Watson Lake	24	Beaver Creek	8
Teslin	13	Carmacks	28
Tagish	31	Ross River	4
Laberge	10	Mayo	121
Haines Junction	2	Dawson	5

2.4 PROJECT ACTIVITIES

All major project activities involving logging were reviewed along with relevant volume information in Volume I. This included Railroads, the Yukon Ditch, Alaska Highway and Canol projects. Timber volumes related to these projects are included in the Transportation, General or Annual Report databases and are mentioned in the individual logging districts in Section 3.0.

2.5 ANNUAL REPORTS REVIEW

Annual reports available at the Forest Resources library were reviewed and all volume information was entered into the Annual

TABLE 10 : CORDWOOD COMPARISON 1899 - 1970

YEAR	ANNUAL REPORTS	HEARTWELL REPORT	LOGGING HISTORY DATABASE TRANSPORT	YEAR	ANNUAL REPORTS	HEARTWELL REPORT	LOGGING HISTORY DATABASE TRANSPORT	GENERAL
1899	NA	NA	3765	1935	11946	11946	6821	
1900	69484	69484	17771	1936	16401	16401	9620	
1901	23656	23166	11997	1937	19677	19677	13751	
1902	22484	23166	4816	1938	17888	17888	14637	
1903	22832	22832	5436	1939	15387	15387	11185	
1904	21652	22832	4384	1940	19531	19531	11811	
1905	11593	11593	200	1941	12847	12847	8733	
1906	13277	12674	NA	1942	13658	13658	7332	
1907	9596	9068	NA	1943	69759	69759	10554	
1908	10545	NA	NA	1944	23567	23567	7507	
1909	19572	NA	1661	1945	11008	11008	8044	
1910	NA	NA	6763	1946	14379	14379	7800	
1911	12642	NA	NA	1947	20838	20838	12514	1596
1912	NA	NA	NA	1948	26071	26071	8749	1221
1913	NA	NA	41054	1949	27827	2097	4834	1641
1914	21661	21661	29397	1950	16003	16003		7541
1915	13787	13787	21914	1951	12629	12629		4675
1916	23075	23075	14906	1952	13135	13135		6892
1917	22088	NA	NA	1953	8401	8400		4390
1918	12808	22088	NA	1954	7897	7054		3889
1919	13108	13108	NA	1955	6171	6171		3050
1920	16100	16100	106	1956	7748	7748		3756
1921	NA	NA	106	1957	5544	5544		3003
1922	20282	20282	NA	1958	5527	5527		2627
1923	16449	16448	NA	1959	5418	5418		2921
1924	11345	11344	NA	1960	7189	6249		5876
1925	10739	10739	NA	1961	4935	4935		3265
1926	14053	14052	NA	1962	NA	6907		6060
1927	9139	9139	NA	1963	NA	5902		4580
1928	16604	16603	NA	1964	NA	8677		6658
1929	15992	15992	NA	1965	NA	6798		6163
1930	15308	15300	NA	1966	NA	8411		6703
1931	9590	9590	NA	1967	NA	9399		6807
1932	8475	8475	NA	1968	NA	10080		9577
1933	7051	7051	NA	1969	NA	6084		7315
1934	9739	9739	NA	1970	NA	5487		5443

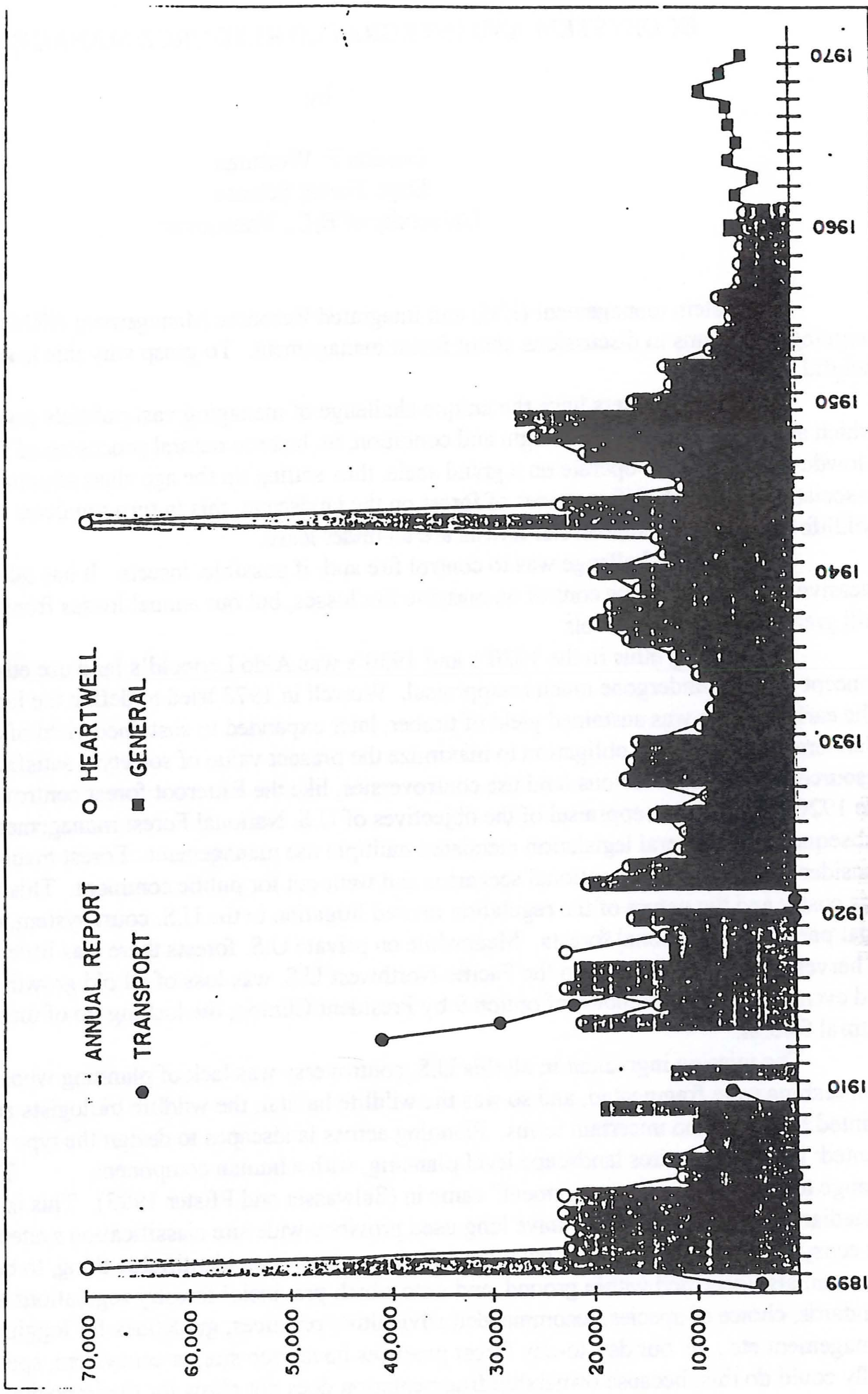
TABLE 11: ANNUAL REPORTS - GENERAL ACTIVITIES

YEAR	REGION	PERMITS	CORDWOOD	SEIZ_CDS	HLOGS_LF	LF	LOGS_FBM	FBM	PIECES	TYPE
1900	40MILE	9	400	0	0	0	0	0	0	
1900	DAWSON	377	41507	0	20010	0	0	7000000	0	
1900	FTSELK	117	10785	0	6726	0	0	0	0	
1900	STEWART	78	6474	0	0	0	0	0	0	
1900	WHHORS	117	10318	0	0	0	0	0	0	
1901	40MILE	13	1315	0	0	0	0	0	0	
1901	DAWSON	215	13771	0	20865	0	0	0	0	
1901	FTSELK	46	4485	0	3130	0	0	0	0	
1901	STEWART	9	630	0	0	0	0	0	0	
1901	WHHORSE	35	2965	0	6055	0	0	0	0	
1902	40MILE	11	437	0	0	0	0	0	0	
1902	DAWSON	193	13215	0	4726	0	0	0	0	
1902	FTSELK	31	3852	0	0	0	0	0	0	
1902	STEWART	13	1870	0	0	0	0	0	0	
1902	WHHORSE	35	3110	0	1680	0	0	0	0	
1903	40MILE	19	2303	0	0	0	95000	0	0	
1903	DAWSON	150	13264	0	3347	0	125000	0	0	
1903	FTSELK	15	1630	0	0	0	0	0	0	
1903	STEWART	13	730	0	0	0	0	0	0	
1903	WHHORSE	32	4905	0	5750	0	0	0	0	
1904	40MILE	6	540	0	500	15000	0	0	0	
1904	DAWSON	80	7566	0	0	2000	20000	0	0	
1904	FTSELK	10	1111	0	0	0	0	0	0	
1904	STEWART	8	1105	0	0	0	0	0	0	
1905	DAWSON	119	11593	0	0	0	0	0	0	
1906	DAWSON	110	12674	0	7000	0	155000	0	0	
1907	DAWSON	0	9048	0	8250	0	244000	0	0	
1909	DAWSON	0	0	0	0	0	0	0	0	
1911	YUKON	123	1150	0	0	0	0	50000	0	
1914	YUKON	144	19819	1842	0	0	0	350000	0	
1915	YUKON	122	12407	1380	0	0	0	1530000	0	
1916	YUKON	163	22318	757	0	0	0	398502	0	
1917	YUKON	145	18524	444	0	0	0	257936	0	
1918	YUKON	81	8973	796	0	0	0	2785	0	
1919	YUKON	86	11625	783	0	0	0	0	0	
1920	YUKON	118	13152	197	0	0	0	0	0	
1922	DAWSON	125	16631	66	0	0	0	0	0	
1923	YUKON	103	15089	69	0	0	0	364666	0	
1924	YUKON	79	10052	196	0	0	0	258901	0	
1925	YUKON	92	8726	82	0	0	0	1250000	0	
1926	YUKON	84	12272	104	0	0	0	137058	0	
1927	YUKON	62	7646	1482	0	0	0	155678	0	
1928	YUKON	92	13345	108	0	0	0	111540	0	
1929	YUKON	0	14560	54	0	0	0	105908	0	
1930	YUKON	105	13570	7	0	0	0	0	0	
1931	YUKON	71	8600	10	0	0	0	0	0	
1932	YUKON	67	7676	67	0	0	0	0	0	
1933	YUKON	77	6974	28	0	0	0	0	0	
1934	YUKON	104	9534	0	0	0	0	67000	0	
1935	YUKON	111	11946	0	0	0	0	185000	0	
1936	YUKON	147	16401	0	0	4000	0	483760	0	
1937	YUKON	149	19677	0	0	5320	0	400000	0	
1938	YUKON	123	17888	0	0	0	0	671576	0	
1939	YUKON	104	15387	0	0	0	0	351157	0	
1940	YUKON	112	19531	0	0	0	0	306000	0	
1941	YUKON	89	12847	0	0	0	0	300000	0	
1942	YUKON	98	13558	0	0	0	0	1305000	0	
1943	YUKON	153	20403	0	0	0	0	1408657	300	TELPOLES
1944	YUKON	130	23567	0	0	0	0	6607284	0	
1945	YUKON	130	11008	0	0	0	0	953657	0	
1946	YUKON	181	14379	0	0	0	0	2539500	0	
1947	YUKON	193	20838	0	0	0	0	2446470	0	
1948	YUKON	179	24566	0	0	4428	0	0	0	
1949	YUKON	276	25730	0	0	14320	0	0	0	
1950	YUKON	237	14211	0	0	0	0	1291000	0	
1951	YUKON	247	11499	0	0	1074691	0	6182751	0	
1952	YUKON	290	12562	0	0	35469	0	0	0	
1953	YUKON	231	7611	0	0	189364	0	0	0	
1954	YUKON	234	7030	0	0	127314	0	0	0	
1955	YUKON	227	5475	0	0	66314	0	35000	0	
1956	YUKON	217	5808	0	0	223657	0	27000	0	
1957	YUKON	198	5004	0	0	99208	0	170000	0	
1958	YUKON	202	4295	0	0	78105	0	25000	0	
1959	YUKON	241	3985	0	0	163166	0	18000	0	
1960	YUKON	244	5729	0	0	239321	0	48000	0	
1961	YUKON	229	4062	0	0	156599	0	0	0	
	TOTAL	8876	789343	8472	[illegible]39	2498276	639000	37794786	300	

TABLE 12: ANNUAL REPORTS - COMMERCIAL ACTIVITIES

YEAR	REGION	PERMITS	BERTHS	CORDWOOD	LF	LOGS_FBM	FBM	PIECES	TYPE
1901	DAWSON	0	18	490	0	0	0	0	
1902	DAWSON	0	0	0	0	0	7936505	0	
1903	DAWSON	0	0	0	0	0	4422400	0	
1904	DAWSON	0	0	11330	0	0	0	0	
1905	DAWSON	6	0	0	0	210000	0	0	
1906	DAWSON	0	0	603	0	0	1624689	44944	TIES
1907	DAWSON	0	0	548	0	0	3488360	0	
1908	YUKON	0	114	10545	0	0	2129413	0	
1909	DAWSON	0	111	19572	0	0	1688952	0	
1911	YUKON	0	108	11492	0	0	534449	0	
1914	YUKON	0	141	0	0	0	173425	0	
1915	YUKON	0	93	0	0	0	75810	0	
1916	YUKON	0	93	0	0	0	79408	0	
1917	YUKON	0	90	3120	0	0	250290	0	
1918	YUKON	0	88	3039	0	0	125000	0	
1919	YUKON	0	82	700	0	0	0	900	PILING LF
1920	YUKON	0	76	2751	16361	0	0	0	
1922	DAWSON	0	0	3585	0	0	0	0	
1923	YUKON	0	0	1291	0	0	0	0	
1924	YUKON	0	0	1097	0	0	0	0	
1925	YUKON	0	0	1931	0	0	0	0	
1926	YUKON	0	0	1677	0	0	0	0	
1927	YUKON	0	0	11	0	0	0	0	
1928	YUKON	0	0	3151	0	0	40625	0	
1929	YUKON	0	0	1378	0	0	0	0	
1930	YUKON	0	0	1731	0	0	0	0	
1931	YUKON	0	0	980	0	0	0	0	
1932	YUKON	0	0	732	0	0	0	0	
1933	YUKON	0	0	49	0	0	0	0	
1934	YUKON	0	59	0	0	0	0	0	
1935	YUKON	0	47	0	0	0	0	0	
1936	YUKON	0	39	0	0	0	0	0	
1937	YUKON	0	34	0	0	0	0	0	
1938	YUKON	0	33	0	0	0	0	0	
1939	YUKON	0	33	0	0	0	0	0	
1940	YUKON	0	24	0	0	0	0	0	
1941	YUKON	0	15	0	0	0	0	0	
1942	YUKON	0	15	0	0	0	0	0	
1943	YUKON	0	15	0	0	0	0	0	
1944	YUKON	0	15	0	0	0	0	0	
1945	YUKON	0	14	0	0	0	0	0	
1946	YUKON	0	14	0	0	0	0	0	
1947	YUKON	0	14	0	0	0	0	0	
1948	YUKON	19	14	1505	44390	0	389164	0	
1949	YUKON	0	14	2097	103307	0	1692689	0	
1950	YUKON	35	0	1792	0	0	2497648	0	
1951	YUKON	53	0	1130	0	0	6155741	0	
1952	YUKON	35	0	573	1991607	0	4997518	0	
1953	YUKON	37	0	790	2202345	0	4116910	0	
1954	YUKON	43	0	867	2201047	0	3483015	0	
1955	YUKON	47	38	696	882274	0	2768579	0	
1956	YUKON	49	0	1940	1936034	0	4865743	0	
1957	YUKON	21	0	540	1314770	0	3004405	0	
1958	YUKON	27	0	1232	1097298	0	2653260	0	
1959	YUKON	35	0	1433	1004189	0	4786592	0	
1960	YUKON	42	0	1460	944568	0	6971189	0	
1961	YUKON	38	36	873	40125	0	3821508	0	
	TOTAL	487	1487	98731	13778315	210000	74773687	45844	

It is important to note that the Annual Reports did not usually report the use of wood for mining purposes as dues were not collected. Miners were allowed the use of timber resources free of charge for their own mining purposes.



CORDWOOD COMPARISONS (1899 - 1970)

ECOSYSTEM AND INTEGRATED RESOURCE MANAGEMENT

by

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Ecosystem management (EM) and Integrated Resource Management (IRM) are the two current reigning paradigms in discussions about forest management. To grasp why this is so, a little history is helpful.

Canadian foresters have the unique challenge of managing vast publicly owned forest estates which are nearly all natural in origin and condition, ie. historic natural processes of fire, insects, blowdown and disease operate on a grand scale, thus setting up the age class structure of the forest, the associated pattern of different ages of forest on the landscape; this in turn regulates biodiversity and wildlife habitat. The commercial forests are all under lease.

Initially, the challenge was to control fire and, if possible, insects. It has taken 50 years of massive effort to get some control on massive fire losses, but our annual losses from natural agents is still greater than harvest levels.

The guiding ethic in the 1920's and 1930's was Aldo Leopold's land use ethic -- an appealing concept that has undergone much re-appraisal. Worrell in 1973 tried to define the land ethic (Table 1). The earlier notion was sustained yield of timber, later expanded to sustained yield of all resources, ie. planners have an ethical obligation to maximize the present value of society's satisfaction from all its resources combined. Various land use controversies, like the Bitteroot forest controversy in Montana in the 1920's caused a re-appraisal of the objectives of U.S. National Forest management objectives. The subsequent U.S. federal legislation mandated multiple use management. Forest management plans had to consider all resources and optional scenarios and went out for public comment. This type of planning was costly and the nature of the regulation invited litigation in the U.S. court system, often leading to legal paralysis on national forests. Meanwhile on private U.S. forests there was little regulatory control of harvests. The end product in the Pacific Northwest U.S. was loss of all old growth on private lands, and eventually after the choice of option 9 by President Clinton, the locking up of most old growth on natural forests.

The missing ingredient in all this U.S. controversy was lack of planning whole forest landscapes. Ownerships were fragmented, and so was the wildlife habitat, the wildlife biologists and ecologists pointed this out in no uncertain terms. Planning across landscapes to design the type of forest society wanted: ie. IRM, requires landscape level planning, with a human component. This is where the strange term "ecosystem management" came in (Salwasser and Pfister 1993). This is strange to Canadian foresters, because we have long used province-wide site classification systems which identify the ecosystems, or ecosystem associations. An ecosystem is an identifiable thing, to be looked up in the site manuals, identified within ground, and onto which provincial forestry regulations attach stocking standards, choice of species, recommended silviculture practices, guidelines for logging, wildlife management etc., ie. our day-to-day forest practices have been site, or ecosystem, specific. Americans really could do this, because ownership fragmentation does not allow for the imposition of standardized site classification to be used by all managers.

You can sense that EM is a concept of U.S. origin, brought about by necessity from their inability to manage vast forest landscape at the rigour, scale and detail required for sustenance of all IRM values. EM has two dimensions (Cartwright and Denver 1994).

The Human Dimension In Sustainable Ecosystem Management: A Management Philosophy

The two fundamental dimensions of the new philosophy of ecosystem management (EM): (1) multiple-use management to meet the needs of the people that depend on the goods and services provided by the national forests and grasslands and (2) sustainable natural ecosystems. These two dimensions have become known as the "human" and the "physical and biological" dimensions of EM.

The human dimension must be integrated into EM to respond to human needs, because humans depend on natural ecosystems for their well-being and survival. Humans, like other living organisms, are integral parts of the ecosystem being managed. Humans influence and are influenced by natural ecosystems. People's past, present, and future values and desires influence ecosystems. Ecosystems affect people's physical, mental, spiritual, social, cultural, and economic well-being.

The bio-physical dimension of EM is concerned with "...sustaining natural ecosystems and protecting biodiversity now and into the future" and managing "...ecosystems such that structure, composition, including genetic diversity, and function of all elements, including their frequency, distribution, and natural extinction, are conserved, with "conservation focusing on maintaining and restoring suitable amounts of representative habitats over the landscape and through time."

(USFS 1994, Rocky Mt. Forest and Research Station, Cartwright and Denver 1994)

Obviously, IRM is part of EM in the current U.S. paradigm for resource management.

What has all this to do with Canada? Our challenges in forest resource management are essentially the same -- we use the same forest science, we also listen to the same proponents of ecological and moral virtue and outrage, although we have some unique ones of our own. The U.S. notions of EM have reached our policy makers and science funders. There is a lot of discussion about forest health, new perspectives in forestry, biological diversity and biological integrity, connectivity, late successional reserves, stand structure as an index to habitat, process and fragmentation, and long rotations. We had 950 students apply to enter the Faculty of Forestry at UBC in 1994. These words are on their lips as well as being aware that there is a shortage of foresters in B.C. and there are lots of jobs. The public is aroused and concerned, the politicians pay attention.

What is different in Canada is this question of landscape level planning. The provinces own the forests, in theory we should succeed in forest landscape design where the U.S. failed. We are further back in time than the U.S.; most of our forests are old-growth, nearly all the animals are still there as they always were, few people live in the forests. We have not foreclosed our options. In theory the provinces, without federal interference (which has been a big U.S. problem), can plan IRM on a grand scale. IRM is the mechanism to facilitate optimal use of available resources at the landscape level. This process involves a balanced assessment of all consequences from potential resource development options, including all impacts, opportunity costs and tradeoffs. It is supposed to direct resources and meet society's present and expected needs (Ritchie 1994). The problem is that there is a "super agency" that performs the integration function. A proactive strategic approach is needed. Who will do it? Can we do it?

When in the late 1920's, under pressure from Prime Minister Bennett, the Federal lands in western Canada were given to the provinces, Finlayson, the Dominion Forester in Ottawa, was outraged. He predicted they would not be responsible managers for at least 50 years. He was about right. It was tragic that he apparently committed suicide because he was so upset.

What is required? A deliberate design process is needed. We know how to do it, we have GIS and landscape planning tools; they are being tested in Canada's Model Forests. We don't need short term fixes, out-of-scale and inappropriate regulations, strong political interference, destruction of bureaucratic initiatives and alienation of tenure holders, managers and executives (Weetman 1994).

Government knee-jerk reactions to environmental pressure almost always result in making problems, not in fixing them. This is not what environmentalists want, and is not consistent with technical skills that exist in most government agencies.

Fundamentally, while much is written on 'visions' and 'strategies' for forests and forestry in Canada, in practice they are extremely vague, wordy and ecologically 'nice'. A designed forest over a 100 year time frame needs, like a bridge, some real design loads and critical examination of design structure options that meet these loads. This type of work is rare in Canada. Nobody really has the mandate in most provinces. Action tends to focus on short-term, inappropriate stand level silviculture fixes and short-term plans.

Eventually, in a country which, unlike the United States, relies on leasing of commercial forests to companies, Canada will have to set up a cooperative, stable and well-funded system of long-term planning and design of forestry between provincial government agencies, tenure holders and the public with federal support. The planning must be technical; consider all 'loads' or values and be long-term and produce identifiable forested landscapes that we can use as goals for annual management actions. The current activity of workshops, round tables, and commissions with stakeholders' input and heavy short-term political decision making, often driven by questionable notions about sustainability and ecological correctness, is great for determining what is 'wanted', but it is no substitute for solid professional design of the 'structure' that will produce the public 'wants'.

The reaction of provinces to this challenge of IRM at the landscape level has not been very successful. In B.C. we are still groping, the NDP government is fixed on stand level 'fixes' in a forest practice code, while virtually ignoring the landscape problem. As AAC's are reduced by landscape constraints (green-up, adjacency rules, old growth reserves, forest ecosystem networks, constraints on cut-block-size, etc.) the economic impact escalates. Unlike the U.S. where private land forests are making up for loss of national forest AAC, this is difficult in B.C. Trucks are traveling 1000 km or more to get wood in B.C. The economic margin now includes the Yukon.

One recognition of the problem by the provinces has been the need for a forestry professions with an exclusive right to practice. B.C. forestry has been professionalized; management plans, silviculture prescriptions and roads require professional approval. Ontario now calls for operating prescriptions in silviculture ground rules. However, there is an "out-of-scale" problem in B.C. with IRM and EM. There has been a tendency to push the IRM decision down to the stand or cut block level and unload the legal responsibility on the prescription writer. This makes RPF's very nervous and ABCPF ethics workshops are well attended. Revised cut block layouts and alternative silviculture systems do not fix landscape level biodiversity or other problems, in fact they may exacerbate them. For example, small scattered cut blocks, with long green-up rules and adjacency constraints tend to favour a) partial cuts which high-grade to avoid adjacency AAC constraints, and b) more and more roads with maintenance problems. These so-called 'cumulative effects' have to be considered.

B.C. has tried to address landscape level land-use zoning in the CORE process in three regions: Vancouver Island, the Cariboo and Kootenays. A lengthy process is involved shared decision making by stakeholders, mostly non-professionals. Eventually lines are drawn on maps, land is zoned without landscape strategic planning. People get mad, very mad. Many feel alienated and threatened; demonstrations and protests have resulted. The CORE quick-political fix is no substitute for cooperative multi-agency landscape level strategic planning by professionals with public consultation.

Superficially, the problem of landscape level IRM in the Yukon should be easier; the forests are simpler, the dynamics are slow and well known, the people few, less at stake and there are fewer agencies controlling the land, unlike Alaska which is already divided up. However, there is little expertise. This has not been a task for Feds. in Canada - except in National Parks.

There is a chance to do it right in the Yukon, to learn from the errors of other jurisdictions, to learn from history. If not, I fear, as the cliché says, "you are doomed to repeat history!" - but I hope not.

If Canada can run a national health care system it should be able to run a landscape level forest care system. If we don't do it well, we will pay the price in the market place with more boycotts on timber and also in pride as we receive more international ecological criticism.

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QUESTION PERIOD

Topic: **Ecosystem and Integrated Resource Management**
Speaker: **Dr. Gordon Weetman**

Q: In your overview of various logging practices in the earlier section of your talk, I perceived your slide of the high-grade logging operations, as well as the resulting laughter, to be, sort of, a shallow jab at selective and selection logging practices. In the end of your talk, you said that we had the chance to do it right. In fact, there are many areas in the Yukon where people have been logging for decades. If you flew over, you would never get the picture that you photographed. As well, forest managers in the Yukon have refused to give serious consideration to selective logging and alternative harvesting methods, partly because they did not learn it in university. So, I would like to see a better balance there, and I would like your response to that point.

A: Let me get your question straight. What is your question exactly?

Q: Why, in your presentation of various logging practices, don't you bring it down to a level of serious consideration of selection harvest techniques?

A: The question of selection harvest has been very much on the agenda in all jurisdictions. But if you go to true selection management, with reversed angioclast distributions, that is actually a very tricky thing to do, and it is not very appropriate for most of our ecosystems. It is a very difficult thing to do, indeed. We are very much into rearranging clear-cuts and leaving things on the landscape and trying various types of shelter with it, and so forth. I think John Zasada -- at least, I hope John Zasada is going to talk about this because he has quite a bit of experience with this in Alaska. I'm not trying to demean selection management, but when you look at the whole of British Columbia and other places, the number of places where you can actually do that on the landscape are extremely limited, indeed, because of the constraints on the south renewability and eroding system and the growth rates that are involved in a system like that.

Q: In the Yukon, the highest quality forests are actually relatively small in area -- as we saw last night -- and I think that selective harvest in those areas would be very appropriate. We are not talking about the huge coastal rain forests here. We are talking about our highest quality forests being restricted to very small pockets in the landscape. I think it is a very different situation.

A: Let me make the caution that, if you do that -- and it's been tried on a big scale around Prince George in the 1960s -- it must be a self-renewing system. The regeneration must come. But I will leave it to John Zasada to talk more specifically about that.

Q: Just one quick comment on the previous question. The Yukon forest management system does not allow the forest manager the legal flexibility to do what the questioner suggested. If the application is for selective harvesting, that can be done, but if it's for clear-cutting, the application has to be adjudicated on that basis. My question to Dr. Weetman is: would you, please, for the benefit of the audience, expand a little bit further on the costs involved, both in manpower and resources, associated with moving from the old multiple use -- or, old forestry, as you called it -- to new forestry. And I would like the politicians and the senior bureaucrats to pay particular attention to this answer.

A: It sounds like you have an agenda of your own. Yes, it costs. It costs real money. I just want to clear up a couple of points here. A lot of people think that the problem is just clear-cutting, and that we should just partially cut, and if you fix things at this level -- and that is just not the case. We found that out the hard way in B.C. and elsewhere. This is why, in B.C., mandatory silviculture prescriptions prepared by professional foresters are required to make that judgment. Professional foresters are requested, or mandated, to carefully consider all the different cutting systems before they choose one, and they must justify that very, very clearly when they make that decision. If you clear-cut, you must explain why. If you're going to do shelterwood, or whatever it is you're going to do, you must explain why. There's lots of tests going on of these things. But if you're going to place that into a framework, and you're going to look at the landscape level multiple use values, and then try and decide what you're going to do at each stand level, that requires a lot of planning and cooperation between the agencies. And that requires real money, and real professional expertise to do that. It's not a job left to amateurs.

And, I think, as the core process shows, it's not left to share decision-making by amateur groups of stakeholders because that creates a lot of stress -- tremendous stress. It should not be left to bureaucrats, who draw lines on maps in the office, and then have to meet the wrath of the people about that. So, this is where we do have our struggle. I sometimes think if we can run a national medical plan in Canada, we should be able to do this -- lots of trouble with that medical system. It requires a lot of cooperation, and a lot of muscle sometimes, to get our medical system working, but it requires some similar cooperation and real muscle to make things work across the landscape on planning over long periods of time.

And there's a real cost to it. And that cost has to be borne by the sale of timber. But the timber is at a high enough price to pay for that these days, so the revenue has to go from the timber and back to the planners. So, there has to be that consistency and professional effort over time. Politicians tend to interfere all the time in this process, and fire the people involved, and have new initiatives.

Q: I have one comment, and then maybe translate one of Gordon's comments about the U.S., since I am one of the few Yanks in the crowd. The first questioner's use of selection -- there's a lot of terminology stuff in here, and I think Gordon dealt with it. But once you start to talk about selection, what are you really talking about? And are you talking about this classical, all age distribution, or are you talking about just three or four age classes, or are you talking about multiple species on a site that have different growth rates? So, to just throw out this idea of selection and say that it's a panacea -- you have to define your terminology pretty closely.

The other thng, with regard to the newspaper article that Gordon threw up, there is no question that, I think, the new power in our Congress is not in favour of -- or, at least, will look a bit different at ecosystem management. But that particular article that Gordon put up there, really didn't deal with the forest services ecosystem management. What that dealt with was the so-called biological survey in the U.S. The biological survey is a very controversial concept. It was dreamed up by the Secretary of the Interior to survey all the biological resources in the United States and using that then to come up with ways of protecting all that. That particular article did not deal with the concept of ecosystem management as the forest service perceives it.

Q: Here in the Yukon, there is a network of communities that is based on subsistence living. When the second last speaker mentioned the costs of trying new things, I would just like to point out that last weekend, there was a meeting on contaminants and the effects of that to a community. If you notice contaminants in a resource like fish and, I guess, clear-cutting and forests, the effects that has on a community and its lifestyle -- those costs are tremendous.

So, I notice you were saying there were four points and, I believe it was the U.S. forestry on communities and economies you were mentioning -- most of those don't look at the community-based. Has anyone, or have you, looked at the cost of clear-cutting on small subsistence-based communities, and how do you weigh those, and what indicators do you look at and weigh when you look at clear-cuts, as opposed to selection logging?

A: I think from your question you are implying that if you clear-cut, something nasty will happen to the community. I don't think there is any biological evidence for that. Is that what you are implying?

Q: You can take the analogy of contaminants and fish and native people will not go out and harvest their fish, or go back to their way of life. The domino effect of that can lead to such things as suicide and alcoholism, etc. If you go in and clear-cut a resource which all of the biological entities are integrated -- humans and communities -- once you start affecting that aspect of it by taking away a resource and not really understanding the connection -- the integrated resource management of it -- like you say, the ecosystem management of it, then you may end up with major problems within a community. Those are major costs that one has to look at.

A: I agree with that.

YUKON CLIMATE AND SOILS: SOME CONSIDERATIONS FOR FOREST RESOURCE MANAGEMENT

by

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INTRODUCTION

Climate is the driving force of ecosystems and describes an envelope that determines forestry potential. Climate and soil forming processes are modified at the earth's surface by relief, geological substratum, time, surface water, topography, and vegetation acting in concert (Bradley et al. 1982). Understanding forest productivity requires an understanding of how climate and landscape interact. Any evaluation of climate/landscape interactions will focus on different processes and weight different variables depending on the scale of the investigation.

This paper undertakes an overview of climate, terrain and soil interactions and their influence on forest ecosystems within the Yukon portion of the Boreal Cordillera ecozone (Ecological Stratification Working Group 1994) stretching from Dawson City in the central Yukon at 64 degrees north latitude through to Watson Lake at 60 degrees N latitude in Yukon's south-east. Climate data from Watson Lake (Liard Basin ecoregon), Whitehorse (Southern Lakes ecoregion) and Dawson City (Klondike Plateau ecoregion) illustrate some of the general patterns of climate influences on forest productivity in the territory. Mean annual temperature , mean seasonal and growing season temperatures as well as the amount and timing of seasonal precipitation have ranges within the three ecoregions that explain the variations in observed in forest growth and successional trends.

Forest productivity patterns outlined in this paper are derived from Yukon forest cover mapping site index labelling for the Liard Basin and the Southern Lakes ecoregions. Productivity values for the Klondike Plateau ecoregion are taken from the Klondike Valley Soil Survey Report (Wamsley et al. 1987). In all cases references to productivity are relative. For data on forest site index and standing volumes the reader is referred to consult with the INAC Forest Management staff.

Within each of the three ecoregions discussed in the report, two major soil landscape types exist. Alluvial (floodplain) sites generally represent the "best" growth areas available. Upland sites in contrast show significant productivity differences as a result of the interaction of climate with terrain properties.

An important soil property that influences forest productivity and resiliency to disturbance is the amount and distribution of plant nutrient within the ecosystem. This distribution varies by species and by element. Forest nutrient availability is complex and not completely understood by forest managers. However, an awareness of potential impacts on forest nutrient status is important when making forest management decisions. Finally, the impacts of physical site disturbances by equipment operation in forested terrain are discussed briefly in this report.

CLIMATE CONSIDERATIONS

Climate in the Boreal Cordillera ecozone of Yukon shows remarkable variation within a pattern of various degrees of continentality. Some of the largest standard deviations of mean climate values recorded in Canada are recorded from southern Yukon stations (Wahl et al. 1987). As a result, in any given year, there can be remarkable variation in weather from year to year with resultant wide overlaps in temperature and moisture parameters for the three ecoregions highlighted in this paper.

Much of the annual temperature differences observed between ecoregions reflects marked winter season differences. In summer mean temperature values display weak latitudinal effect due to the long or continuous hours of daylight (Wahl et al. 1987). (Figure 1 and 2) illustrate the degree of variation between January daily mean temperatures and July mean annual temperatures. The July daily means show little variation by latitude and the existing variation is largely explained by altitude. A very different distribution of temperatures are observed for January. The Whitehorse (Southern Lakes ecoregion) area experiences considerable temperature moderation due to maritime weather systems moving inland form the Gulf of Alaska during the winter months. Each ecoregion expressed a different degree of continentality. Continentality is indicated by the extent of difference between mean January and mean July temperatures. Dawson City (Klondike Plateau ecoregion) has the most continental climate of the three stations.

Temperature regime and growth conditions:

Although Dawson City, Whitehorse and Watson Lake all have continental tending climates the annual mean temperatures show Dawson City (-5) to be significantly colder on average than Watson Lake (-3.3) and Whitehorse (-1.1)(Figure 3). This annual range of temperature reflects the pronounced winter temperature differential illustrated by the variation in mean January temperatures.

Mean annual temperatures are a reliable indicator of the likely presence of permafrost. The Klondike Plateau ecoregion will commonly have permafrost invasion under climax vegetation types. In the Southern Lakes ecoregion on the other hand, permafrost soil conditions are much less prevalent. The Liard Basin ecoregion falls between the other areas in mean annual temperature. However, generally deep snow accumulations of insulate the soil from extremely low temperature during the winter with the result that permafrost remains only scattered within soil environments. All three regions display a range of permafrost soil conditions.

As previously alluded to, summer temperature range is quite uniform over the Boreal Cordillera Ecozone. (Figure 4) shows growing degree days and duration of optimum growth temperatures for Dawson City, Whitehorse and Watson Lake. Growing degree days (GDD) are a measure of heat available for plant growth and reflect accumulated degrees between the mean daily temperature and 5 degrees C, the accepted threshold for plant growth. Dawson City accumulates the highest number of GDD at 1014 (displayed as 100% on the graph) while Whitehorse accumulates the fewest GDD at 897. Dawson receives about 11% more GDD than Whitehorse.

The duration of optimum temperatures during the growing season (between 15 and 25 degrees C) is another forest productivity consideration. Dawson City shows a higher percentage of days when the maximum temperature reaches greater than 20 degrees C. The optimum temperature duration percentages for Whitehorse and Watson Lake show a very slight advantage to Whitehorse.

Precipitation regime:

Watson Lake, with an annual precipitation total of 425 mm, has the highest values of the three ecoregions discussed. (Figure 5) shows the monthly mean precipitation pattern for Watson Lake. Precipitation peaks in July. About 55% of precipitation falls as rain in Watson Lake. Rain fall is the majority source of precipitation for the three stations used as illustrations in this paper. Total precipitation is significantly higher in the Liard Basin "due to proximity to synoptic storm tracks and favoured locations for cyclogenesis" (Wahl et al. 1987). Higher precipitation totals combined with a moderate temperature regime gives the Liard Basin a moisture deficit value (precipitation minus potential evaporation) of about -120 mm, the lowest of the three ecoregions.

(Figure 6) shows the mean monthly precipitation for Dawson. The mean annual precipitation value is 322 mm. The Klondike Plateau exhibits a climate of extremes and makes generalization precarious. Dawson City is the only station in the Yukon that has recorded precipitation totals in a 24 hour period that meet or exceed the monthly average in every month but September. The bulk of precipitation at Dawson falls as rain with approximately 45% falling during the growing season. Moisture deficit calculation for this site is about -160 mm.

It is in precipitation distribution and quantity that the Yukon Southern Lakes ecoregion demonstrates a significant growth condition differential from the other regions discussed here. Average annual total precipitation at Whitehorse is 270 mm. Lower precipitation values throughout the ecoregion result from the rain shadow cast by the Coast and St. Elias Mountains. Moisture deficits in the Southwest Yukon are in the order of -225 mm.

(Figure 7) illustrates the other important characteristic of precipitation availability in the south-west Yukon. April and May are very dry and the peak growing season in terms of temperature and moisture availability is delayed until June. Precipitation peaks in August rather than July when temperatures are optimum for plant growth.

In summary, it appears as though it is the availability of soil moisture that is the overriding constraint on potential forest productivity in upland landscape positions.

SOIL CONSIDERATIONS

Soil landscape relationships

The interaction of climate, relief, and geologic parent materials produces a range of permafrost, soil development and vegetation cover. (Table 1) outlines the relationship between these factors and resultant forest productivity values. In the Southern Lakes ecoregion permafrost is scattered on the upland landscapes. Low precipitation values result in forest productivity that is somewhat higher than the central Yukon but still relatively poor (Figure 8a). Due to cold mean annual temperatures, permafrost is widespread on upland landscape positions in the Klondike Plateau ecoregion and forest productivity is low (Figure 8b and c). In the Liard Basin ecoregion of the southeast Yukon, moderate temperatures and ample seasonal precipitation produce moderate productivity on upland sites (Figure 9). In all cases, site history determines the actual forest cover.

As previously discussed, floodplain sites with optimum soil moisture tend to have the highest productivity. A similar range of species occupy the floodplain positions in all three ecoregions. Floodplain soils are unique in that they are periodically rejuvenated by sediment additions. Forest floor materials are often buried where they decompose and provide nutrients at depth within the soil. These active sites tend not to develop permafrost until very late stages of maturity in the Klondike Plateau ecoregion (Figure 10) and rarely if at all in the southwest or southeast regions. Fresh soils also tend not to be leached of important base elements which help encourage forest growth. Extensive research results exist for alluvial white spruce forests along the Tanana River near Fairbanks, Alaska (Van Cleve and Viereck 1981, Viereck 1989). Similar ecological process exist with the alluvial sites with the ecoregions of southern Yukon. The growth processes active in the alluvial sites in the southeast Yukon are likely to be similar to those of the boreal forests of northwestern Alberta and northeastern B.C.

Soil Conditions and Reforestation

Much of the present and future forest harvesting will concentrate on the alluvial ecosystems of the southeast Yukon. Due to their inherent productivity, these are most attractive to commercial operations. As such, the following discussion will focus on these sites and the soil properties that are of most important to sustainable development.

(Figure 11) illustrates the distribution of nitrogen and potassium in these ecosystems. The origin of most soil nitrogen is from the decomposition of organic matter. It can be seen that over 60% of the site's total nitrogen pool resides within the forest floor organic layers. Phosphorus (not shown) has much the same distribution. As these layers slowly decompose, nitrogen in plant available form is liberated by microbes for root uptake. On the other hand, available potassium originates through the weathering of mineral particles in the soil. Hence, the majority of the site's potassium pool resides within the mineral soil while less than 10% is found within the organic layers of the forest floor. Disturbance to the forest floor will affect nutrients in different ways. Harvesting trees from a site, leaving limbs and needles behind exports only a small proportion of the site's nutrient capital. On the other hand, a hot fire which consumes the forest floor, needles and limbs will result in a relatively greater depletion of site nitrogen. Much of the organically bound nitrogen is volatilized and may be lost from the ecosystem. Any organically bound potassium becomes available from the ash of burned organic debris on-site.

The role of the forest floor in supplying nutrients and water is demonstrated by the rooting habit of most conifers, particularly white and black spruce. In the schematic illustration in (Figure 12), the difference in rooting habit of trees relative to grasses is shown. Typically, forest soils maintain most of the nutrients near the surface within layers of decomposing needles, leaves, twigs, wood and herbaceous matter. Grasses tend to root deeper within the mineral soil. Over long periods of time, the accumulation of decomposing roots in the mineral soil elevates the organic matter content and builds the "topsoil" that most of us associate with fertile mineral soil types of prairie environments. Such a "topsoil" layer does not usually develop in the forest soils of the Yukon.

The build up of a forest floor occurs rapidly within the first 50 years following disturbance (fire or flooding) on alluvial sites as shown in (Figure 13). The ultimate thickness of accumulated organic debris on a forest floor is determined by moisture regime, temperature, presence of decomposing organisms and time. Fire is a natural process within the boreal forest and sites are amazingly resilient to its effects. The long term effects of forest harvesting are less well known. Prescribed fire is often used as a site preparation treatment.

Reforestation of these sites is a challenge. Early research in the Liard Basin indicated that five years after treatment, scarification increased seedling survival and growth, that broadcast seeding out-performed spot and natural seeding and that spring planting of container stock was a reliable regeneration technique (Gardner 1983). Regeneration may be enhanced by scarification as shown in (Figure 14) buy enhancing the microclimate for seedlings. Ironically, the forest floor, while an invaluable storehouse of plant nutrients, is not a suitable medium for seedling establishment. Most seedlings, whether seeded or planted, need to root into mineral soil. Removing small portions of the forest floor by blading or mounding of the soil achieve the best rooting habitat and microclimate modifications. Removing competing vegetation and it's attendant shading, can increase soil temperatures throughout the boreal forest ecozone. Longer term growth requires the presence of the forest floor as a source of nutrients and water.

Any comprehensive forest policy must address the issue of reforestation. Careful planning and evaluation of forest floor conditions is vital to successful and timely regeneration on cut-over boreal forest sites. Ultimately, successful regeneration is based on the proper selection of tree species for the site matched with an appropriate soil treatment.

Mechanical Disturbance and Erosion

Often the damage to forest ecosystems is not the removal of tree boles from the site but rather the physical disturbances caused by the machinery doing the harvesting. Most site disturbance is associated with roads, particulary main haul roads and secondary skid trails. Disturbances tend to increase on sloping lands. On-going disturbance and even loss of site productivity result from erosion along the roads by run-off water not properly controlled. These types of disturbances are completely avoidable and there is little reason for long-term site damage of this sort. Techniques to minimize disturbances in road building on sloping terrain are well established (Chatwin et al. 1994). Avoiding steep slopes is the best way to eliminate problems of this sort. Designing roads to control run-off is essential. Also, specially attention must be paid to the placement of cut blocks in alluvial landforms so as to mitigate streambank erosion. Any forest management policy must clearly address the issue of cut block size, location as well as harvest roads, skidding layout and post-harvesting maintenance in order to ensure sustainable productivity on these sites.

SUMMARY

Growing season temperatures in the Boreal Cordillera Ecozone of Yukon are not sole determinants of observed forest productivity differences. Mean annual temperatures are an important indicator of the prevalence of permafrost development under mature vegetation cover and therefore indirectly limit forest productivity in the ecoregions of the central Yukon. There is little to choose between the growing season temperatures of the three ecoregions. Moisture availability is the key climatic element in forest productivity. The best sites (alluvial sites with optimum moisture availability) in all three ecoregions described have roughly similar forest productivity. Sites dependent on ambient moisture inputs (most upland site) will have higher productivity in Liard Basin than the South-west Yukon.

Forest fire is ubiquitous within the boreal forests of Yukon.

Forest soils of the Yukon are generally low in organic matter and the management of the forest floor is an important regeneration consideration. After harvesting, most sites will require planting stock following some sort of site treatment. Mechanical and erosion impacts must be considered when designing cutblock layout and roads.

All forest management decisions must be based an analysis of a host of resource (wildlife, habitat, viewscape, biodiversity, ecomonic) and social issues.

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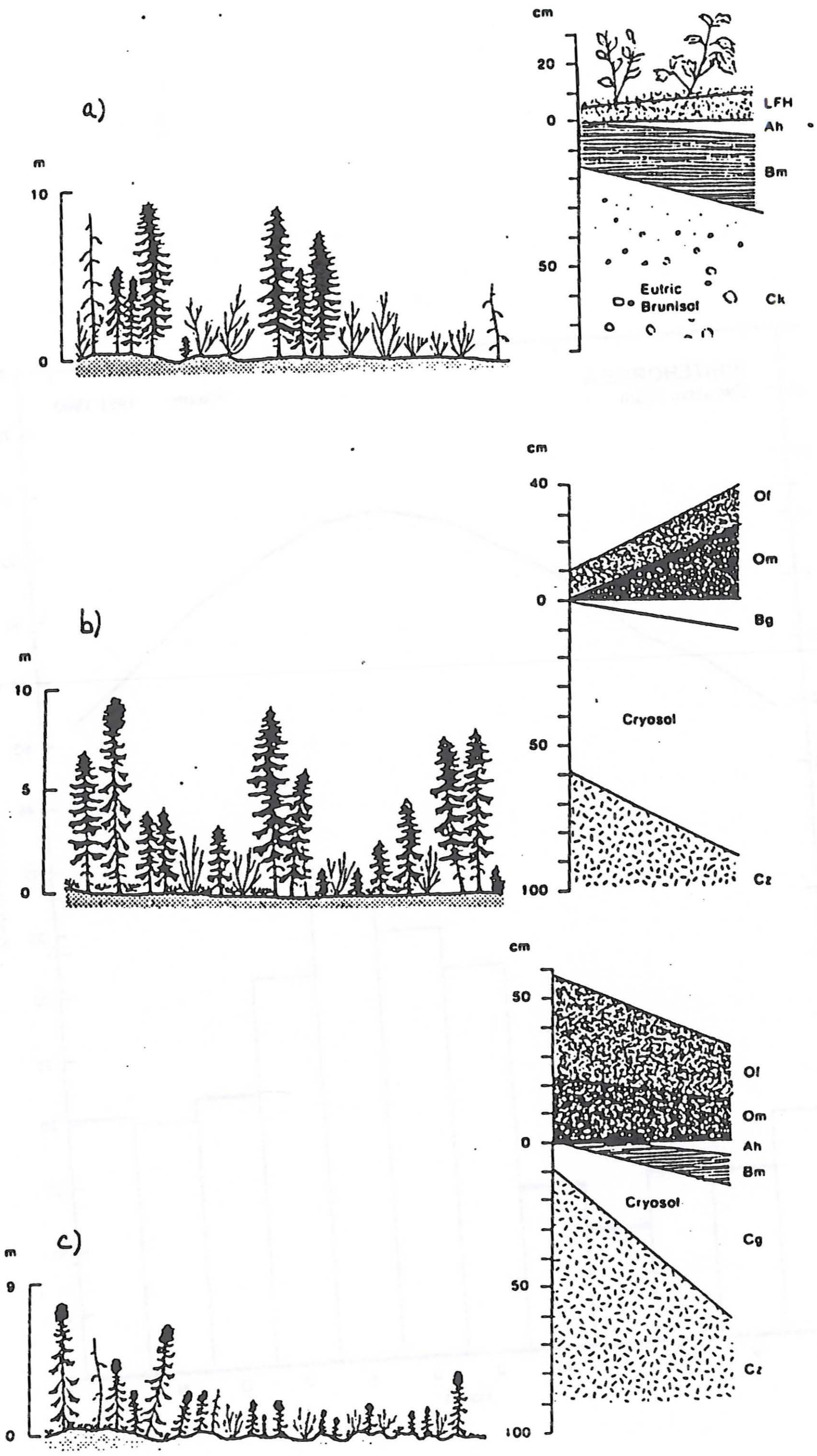
LIST OF FIGURES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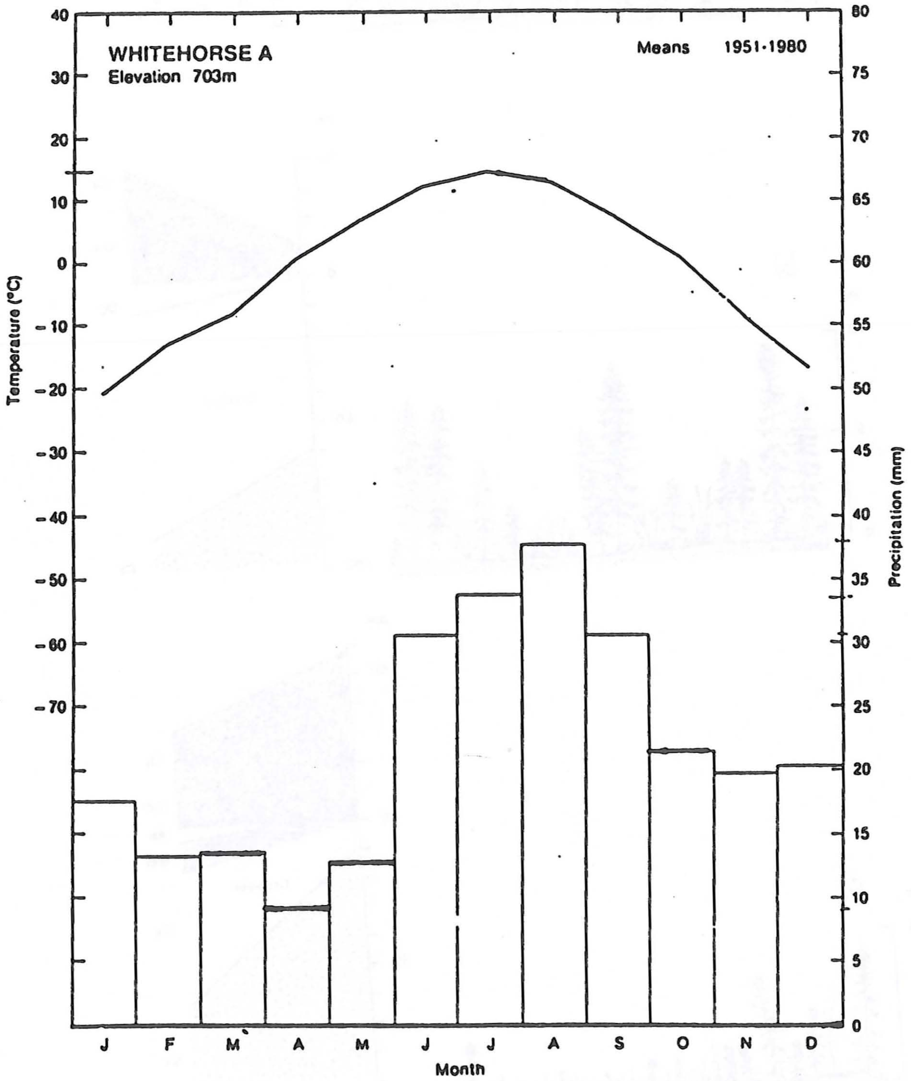
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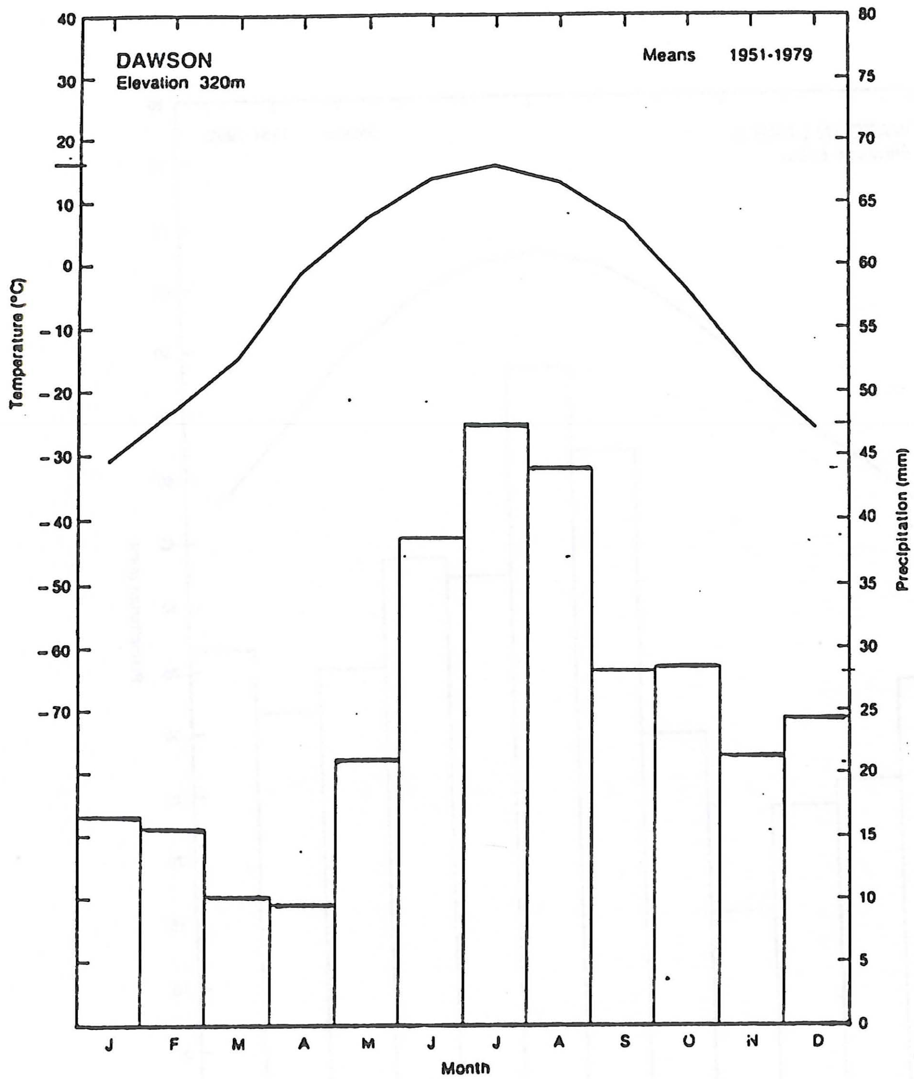
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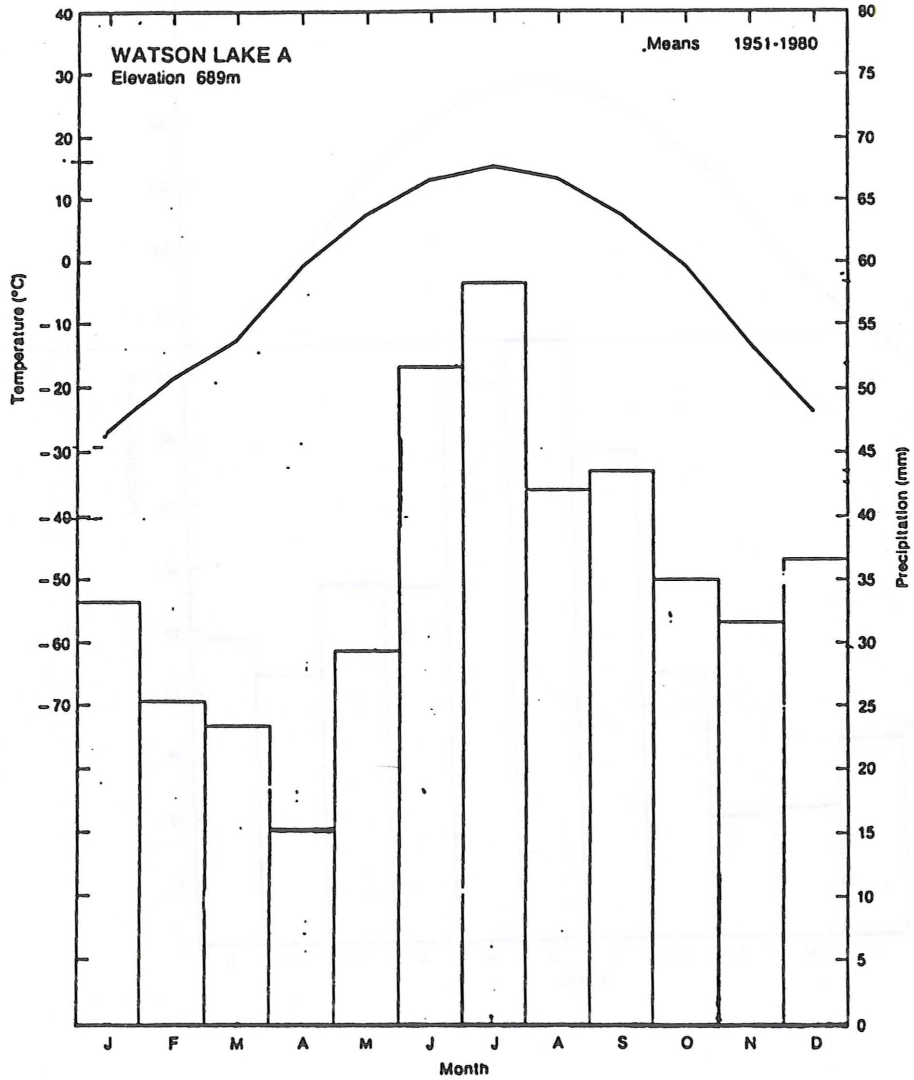
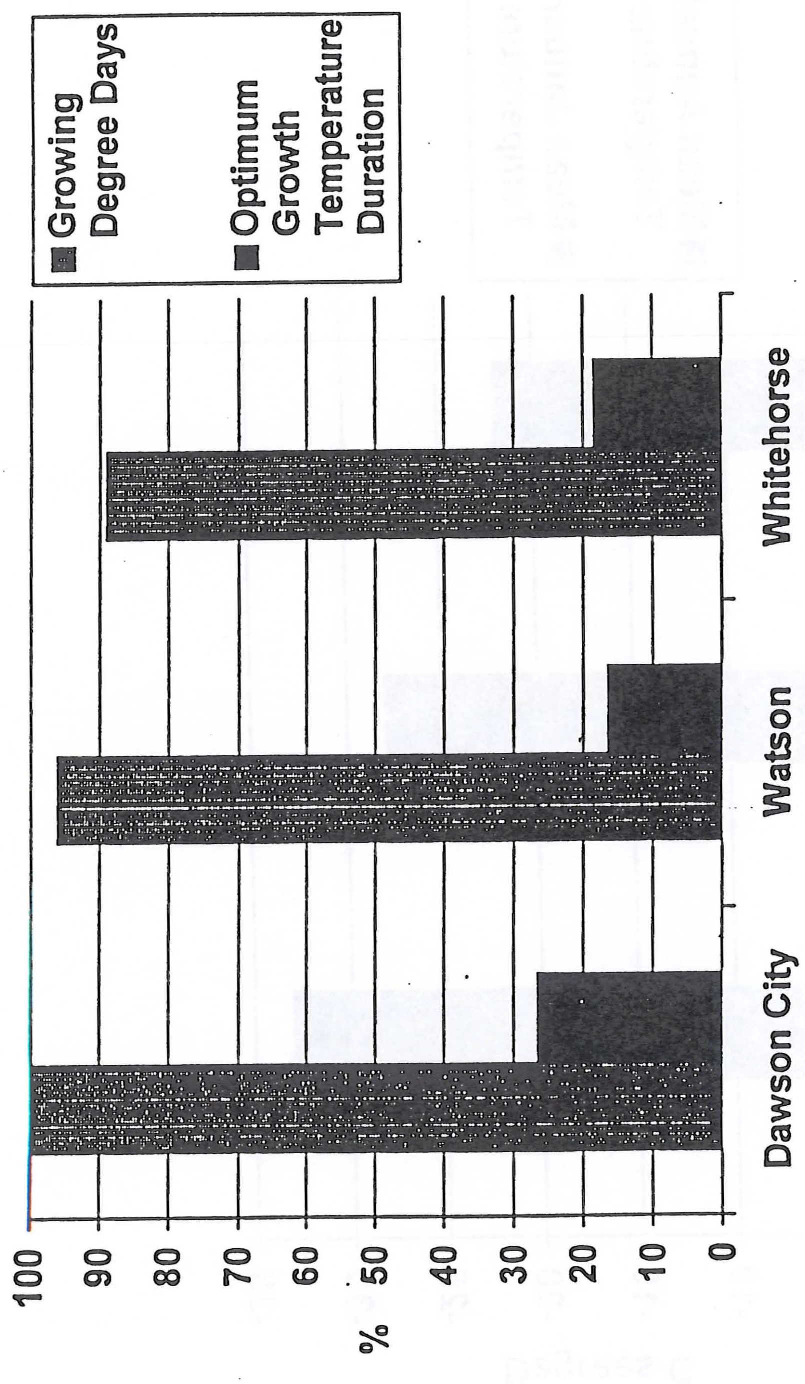
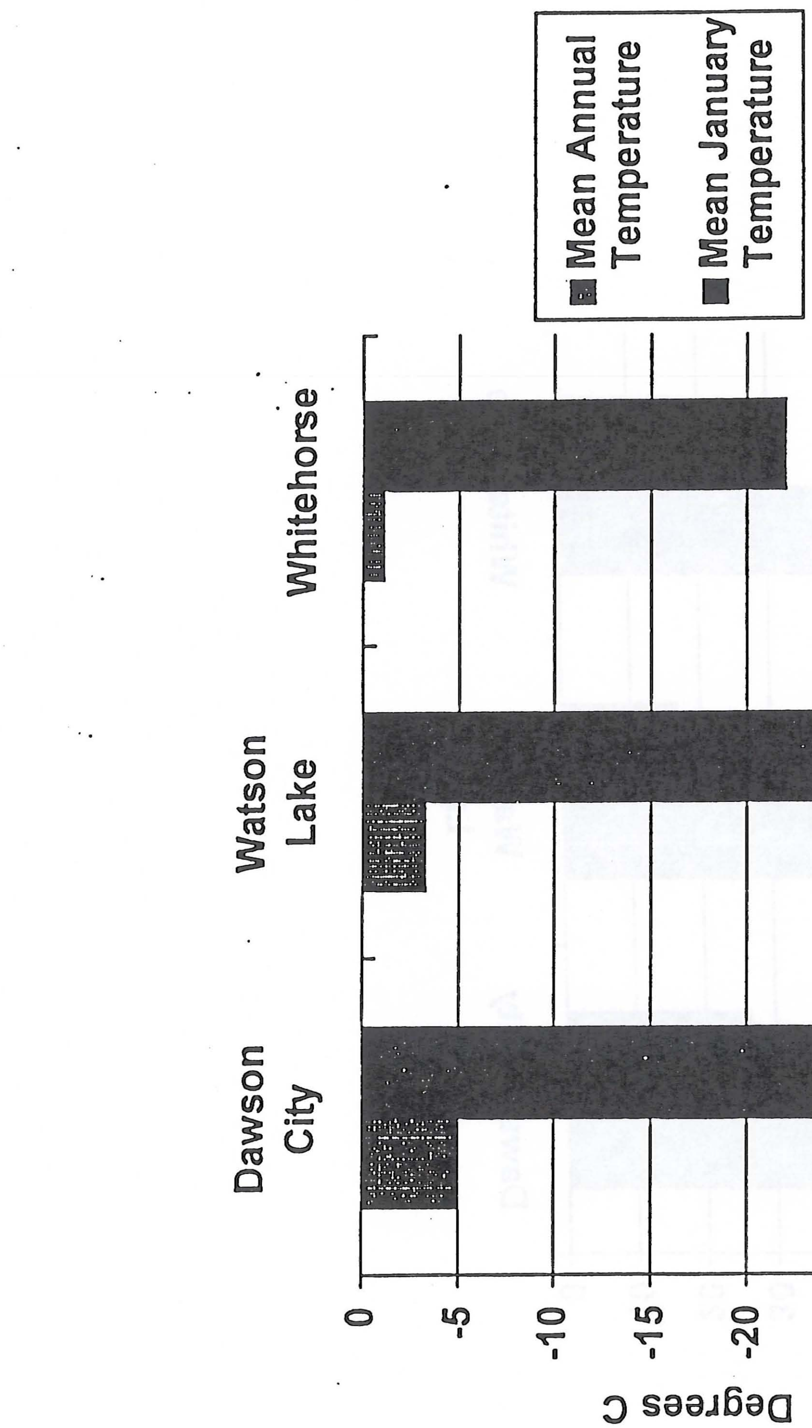
45
40
35
30
25
20
15
10
5
0


WATSON LAKE A
Elevation 689m
Means 1951-1980
Temperature (°C)
Precipitation (mm)
J F M A M J J A S O N D
Month
40
30
20
10
0
-10
-20
-30
-40
-50
-60
-70
80
75
70
65
60
55
50
45
40
35
30
25
20
15
10
5
0


%
100
90
80
70
60
50
40
30
20
10
0
Dawson City
Watson Lake
Whitehorse
Growing Degree Days
Optimum Growth Temperature Duration


Dawson City
Watson Lake
Whitehorse
Mean Annual Temperature
Mean January Temperature
Degrees C
0
-5
-10
-15
-20
-25
-30
-35

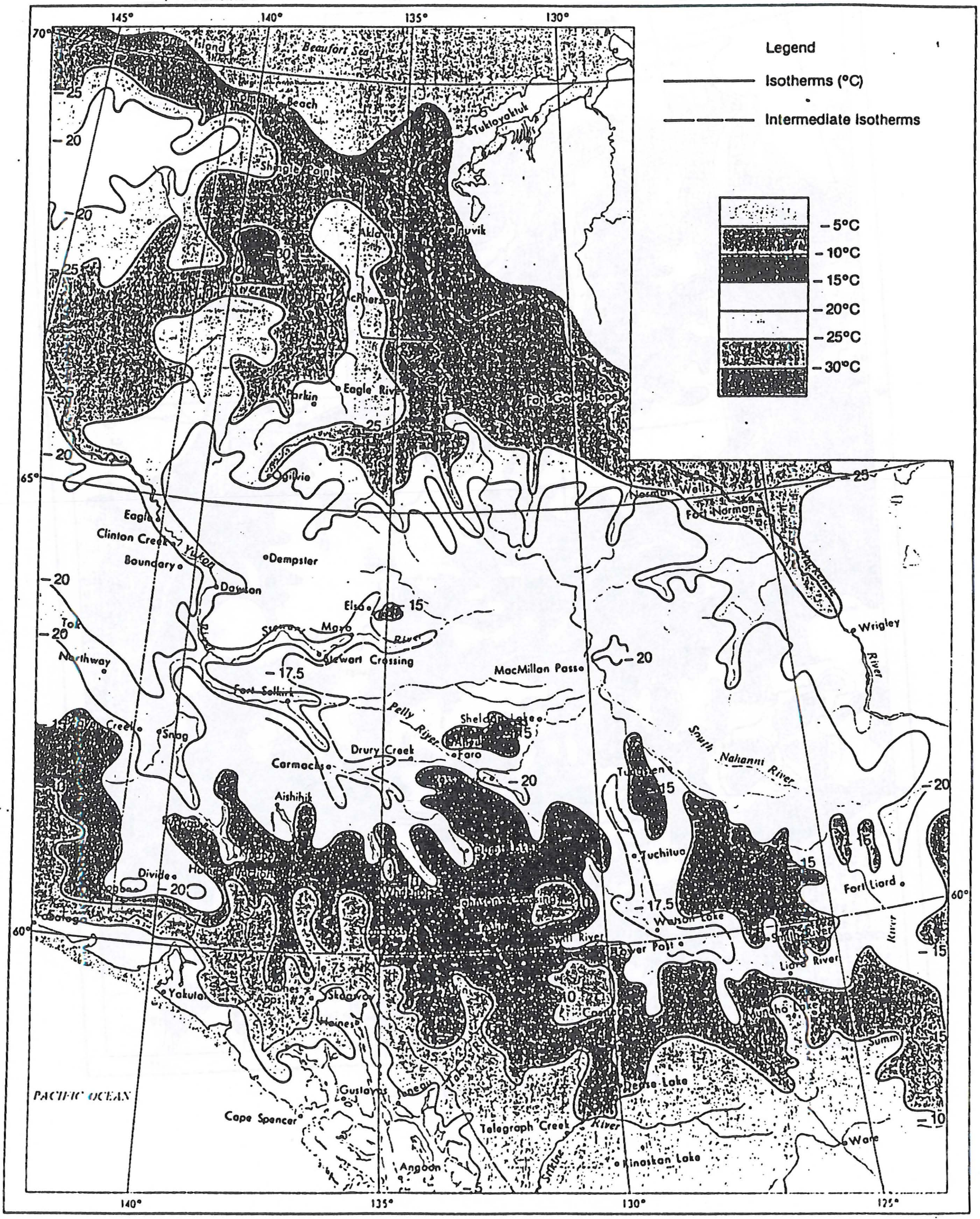


Figure 2: February mean daily temperature

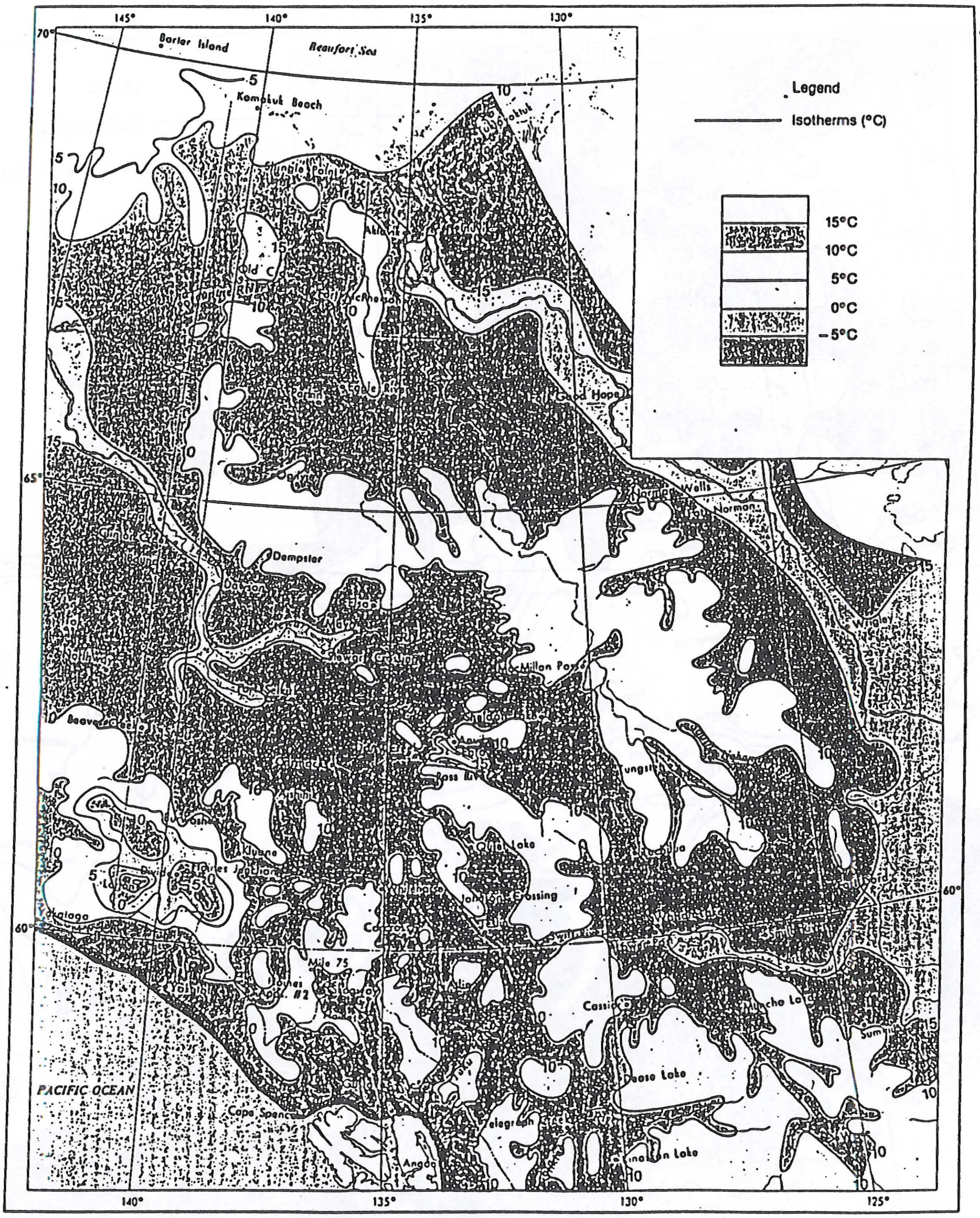
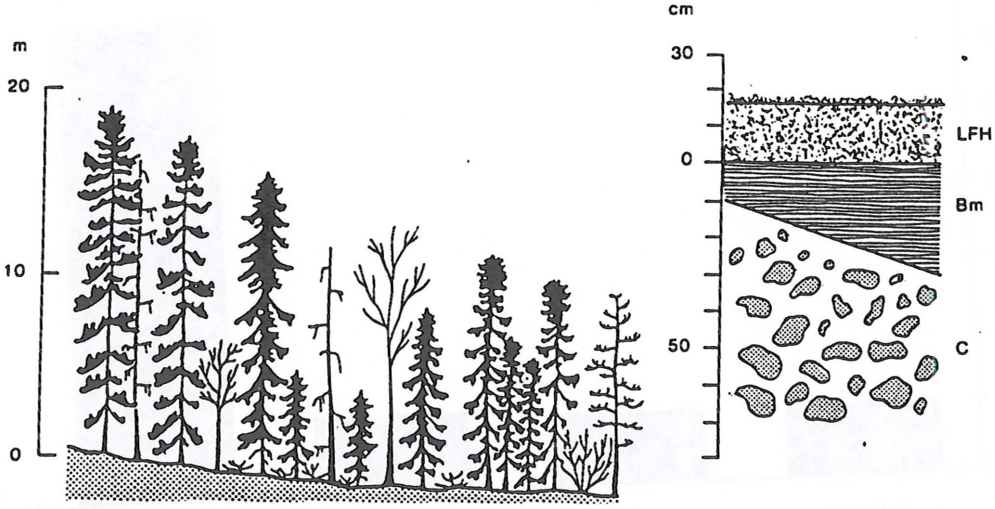
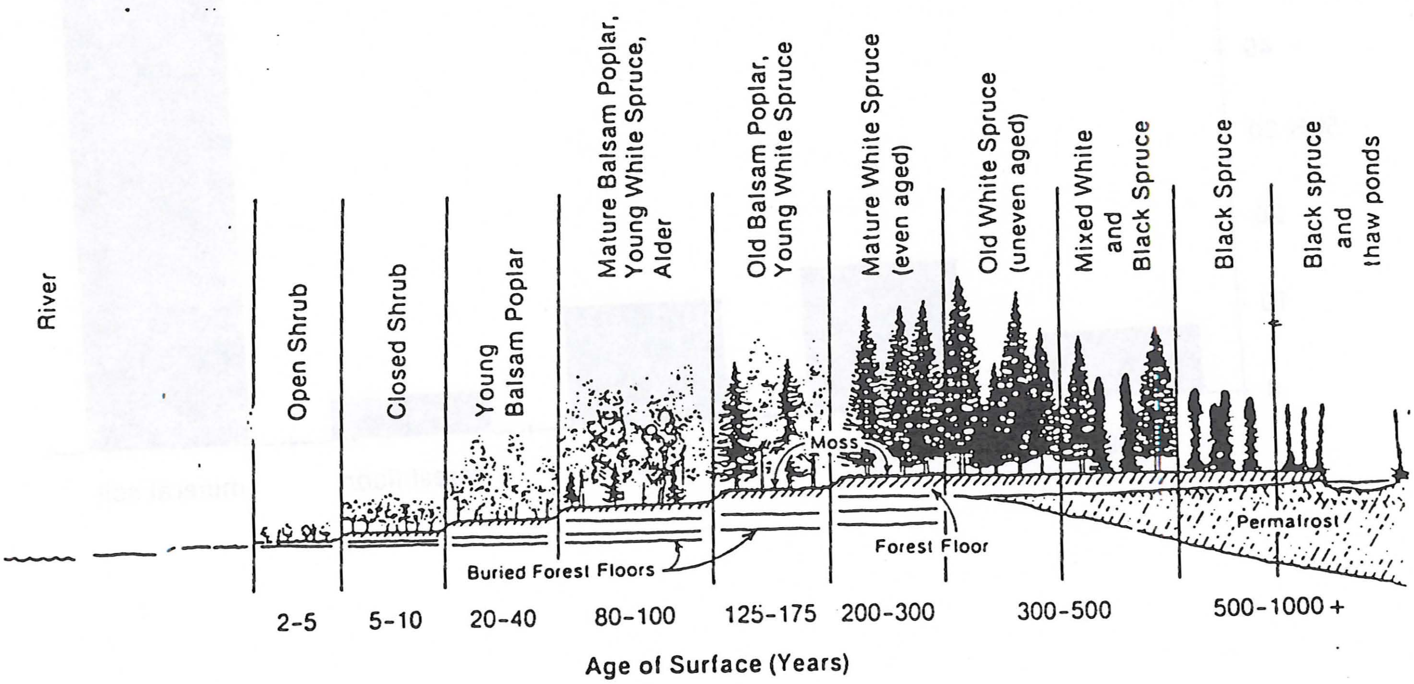
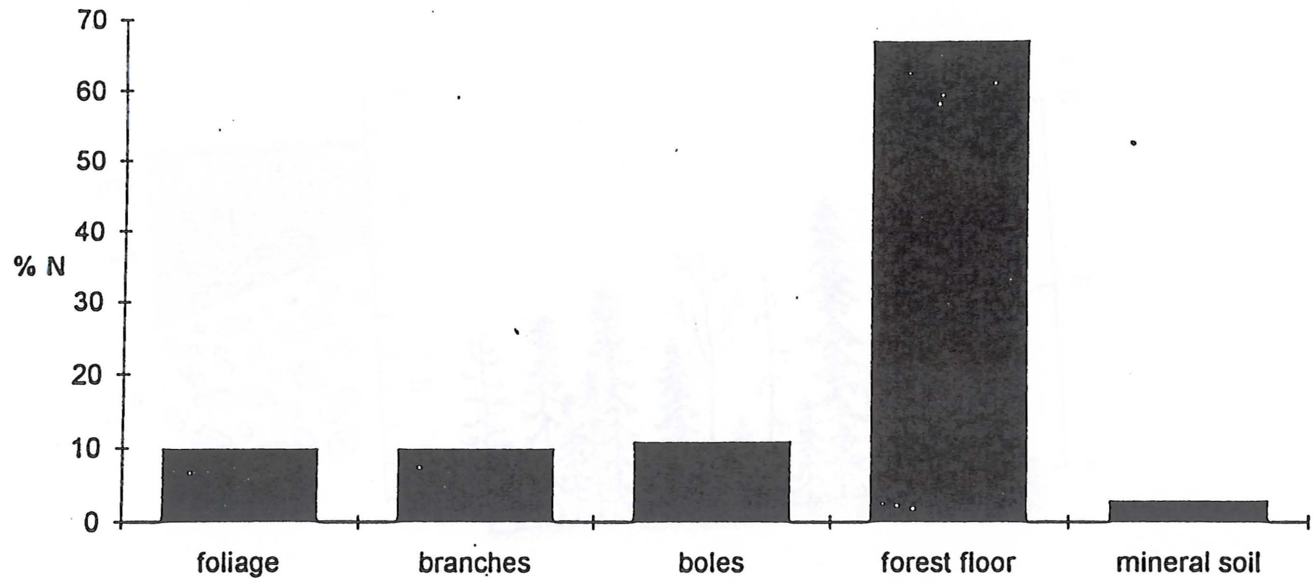


Figure 1: July mean daily temperature

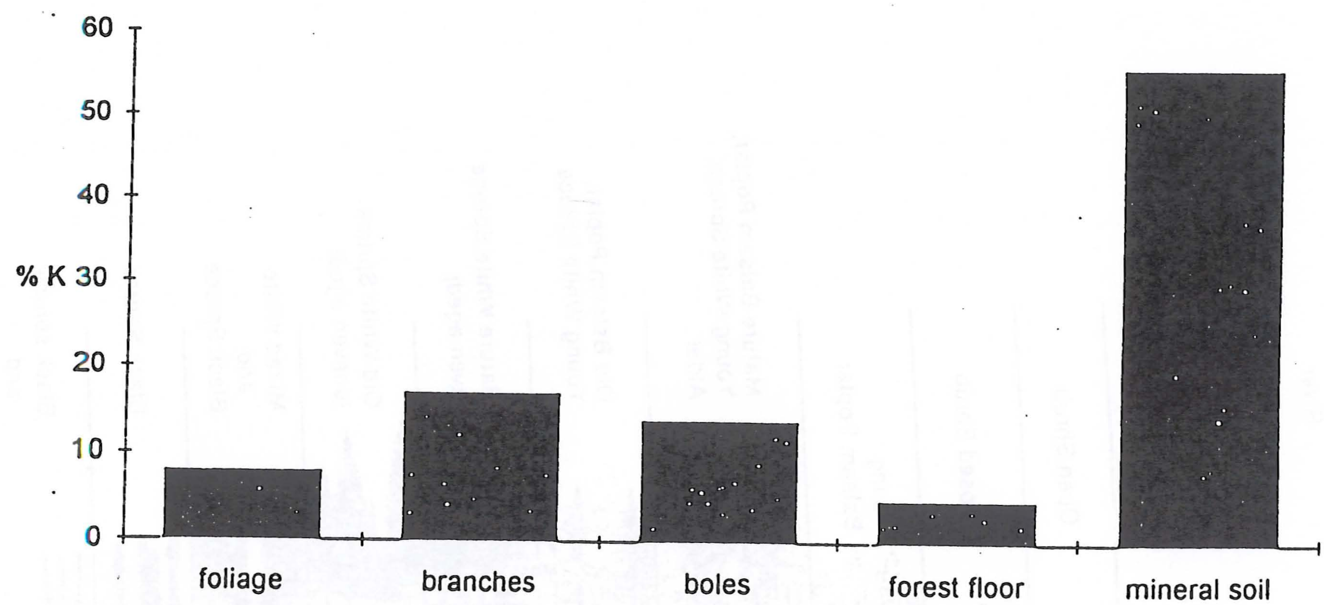

m
20
10
0
cm
30
0
50
LFH
Bm
C

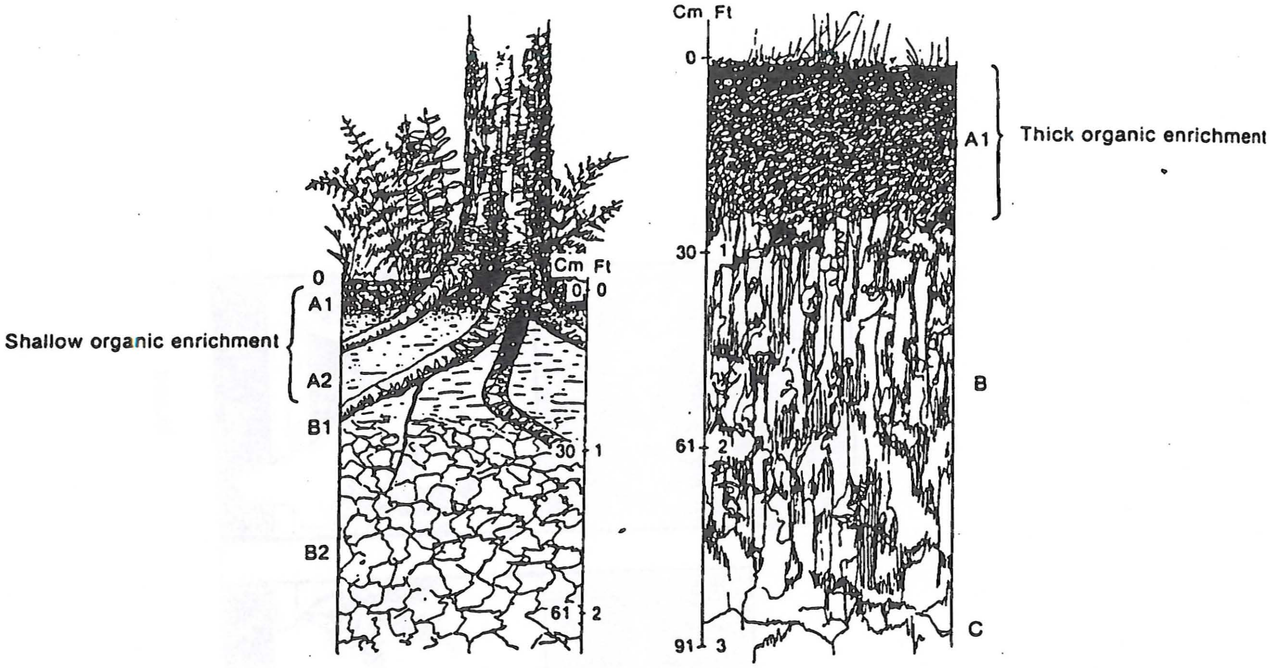

River
Open Shrub
Closed Shrub
Young Balsam Poplar
Mature Balsam Poplar, Young White Spruce, Alder
Old Balsam Poplar, Young White Spruce
Mature White Spruce (even aged)
Old White Spruce (uneven aged)
Mixed White and Black Spruce
Black Spruce
Black spruce and thaw ponds
Moss
Buried Forest Floors
Forest Floor
Permafrost
2-5
5-10
20-40
80-100
125-175
200-300
300-500
500-1000 +
Age of Surface (Years)

a) Nitrogen Distribution

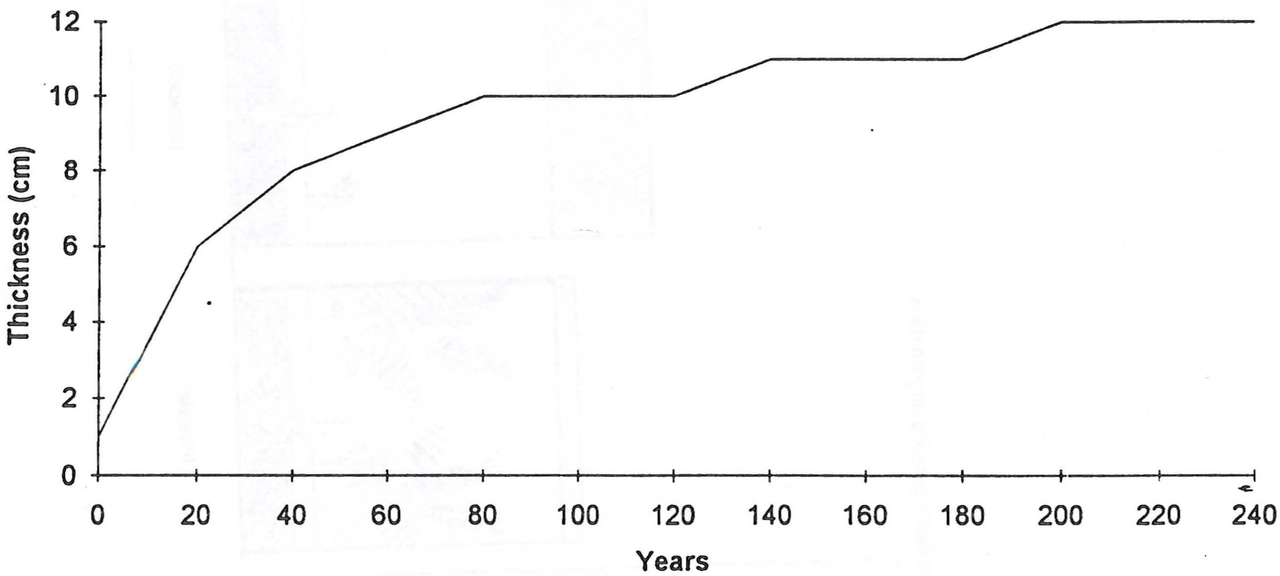


b) Potassium Distribution





Shallow organic enrichment
0
A1
A2
B1
B2
Cm Ft
0 0
30 1
61 2
Cm Ft
0
30 1
61 2
91 3
A1
Thick organic enrichment
B
C



Thickness (cm)
Years
0
2
4
6
8
10
12
0 20 40 60 80 100 120 140 160 180 200 220 240

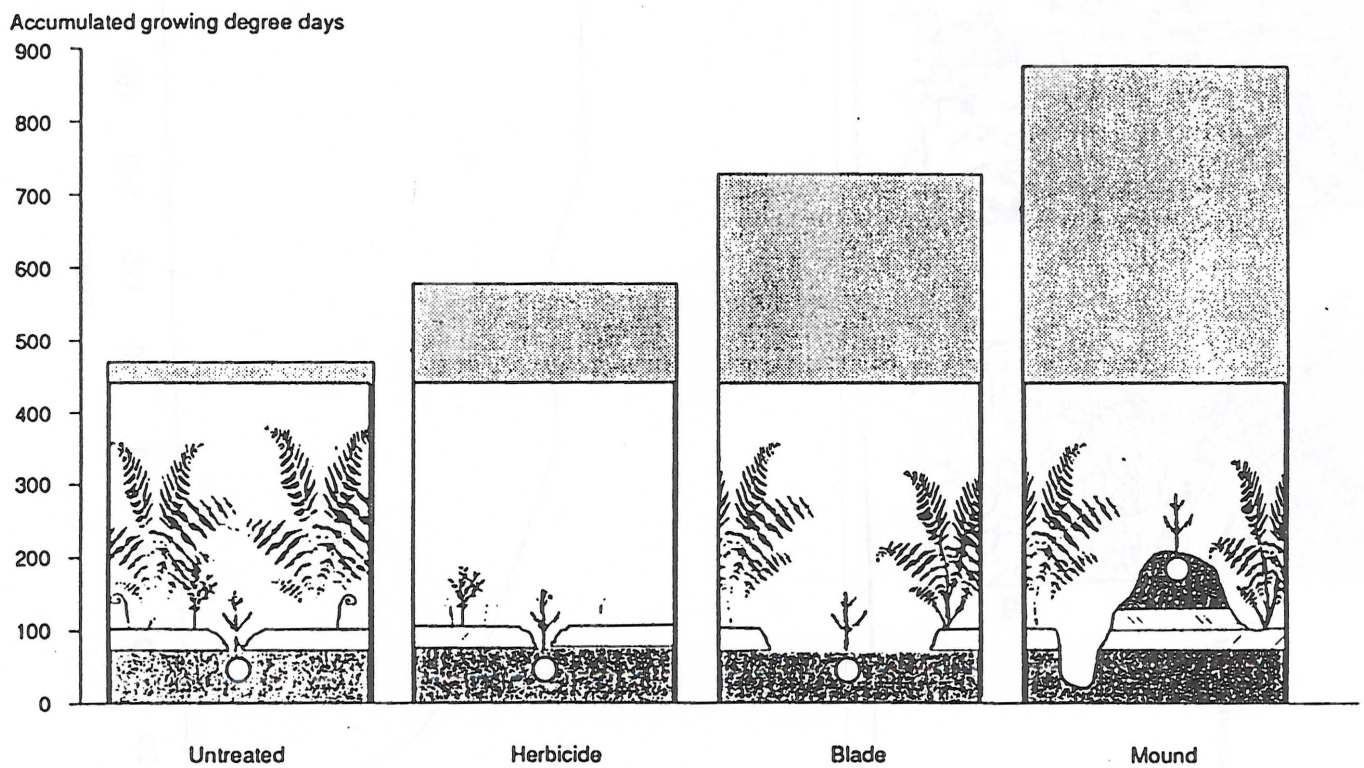

Accumulated growing degree days
900
800
700
600
500
400
300
200
100
0
Untreated
Herbicide
Blade
Mound

Table 1. The relationship between soils, vegetation cover, permafrost and forest productivity in selected ecoregions of the Yukon.

Location	Ecoregion	Landscape position	Permafrost	Soil Development	Predominant Cover Species	Relative Productivity
Central	Klondike plateau	upland	widespread	Cryosol	open black spruce	very low
		floodplain	scattered	Brunisol/Regosol	closed white spruce	high
Southwest	Southern Lakes	upland	scattered	Brunisol	closed pine/w.spruce	low
		floodplain	very scattered	Brunisol/Regosol	closed white spruce	high
Southeast	Laird Basin	upland	scattered	Luvisol	closed pine/b.spruce	medium
		floodplain	absent	Regosol/Brusiol	closed white spruce	very high

QUESTION PERIOD

Topic: **Yukon Soils and Climate**
Speakers: **Dave Murray and Scott Smith**

Q: I was quite surprised at the level of nutrients that remain after logging. To facilitate regrowth, upon silviculture, are more nutrients needed than are left in the natural soil?

A: I think it is site-specific, and perhaps I over-simplified things a little bit by presenting that one histogram up there. To answer your question, it would be site-specific, and a little more complex than I could probably answer for you in 15 seconds. But I can talk to you later about this. A person like Gord Weetman would also be someone to ask these questions to -- and Ed Packee.

MAMMALS AND FORESTRY IN THE BOREAL FOREST

by

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Boreal forest mammals are probably familiar to most Yukoners and indeed, most mammals in the Yukon live in forested habitats. They tend not to be highly specialized in their use of habitats relative to species from, for example, tropical forests. This is not surprising given the dynamic nature of the boreal forest.

Fire is a frequent landscape modifier so the forest tends to be quite heterogeneous (patchy) and the climax communities tend to be relatively young and short-lived. Most mammals have adopted a strategy of being able to live in a variety of forest types. This is not to say that animals do not have habitat preferences or seasonal habitat requirements, but they are rarely locked in to one forest type.

As an example, we will look more specifically at moose. Rob Florkiewicz, the Regional Biologist from Watson Lake studied moose movement and habitat use, including the use of cutblocks in the Liard Basin of SE Yukon. He made some interesting observations on how moose use the landscape.

Moose are generally known to be associated with shrub habitats, such as early successional stages in forest development or subalpine shrub zones. In areas where snow gets to be fairly deep, moose move to river valleys in the winter. The Liard River valley, for example, is a known moose winter range.

Rob observed that some moose remained year-round in the valley and nearby uplands, whereas others would make short or long (> 100 km) migrations from summer ranges to the Liard valley to winter. He found these movements to be consistent among individuals from year to year. For example, cow moose would calve in the same location every year and then winter in the Liard valley.

The habitat type that moose were most frequently associated with in all seasons was the mature white spruce type. These stands make up <3% of the total area and in themselves do not have much food for moose. However, they provide excellent cover and are usually near to good feeding habitats such as riparian shrub zones.

These white spruce stands also contain the highest quality timber. What happens when you log them? It is commonly accepted that moose benefit from logging because of the creation of early successional habitats that provide food. Indeed, Rob found that the amount of browse produced in cutblocks older than 10 years and in natural riparian shrub habitats was similar (about 200 kg/ha). However, moose used 20-30% of available browse in riparian habitats compared to 10% in the cutblocks.

Rob speculated that the differential use may be related to how close these feeding areas are to the river channels. The cutblocks tended to be farther away from the river than the riparian sites he sampled. Moose appear to like to travel along the river channels and then move into adjacent riparian shrub habitats to feed.

In summary, logging does produce food for moose but they may not use this browse to the same extent as natural shrub areas. The positive effect, if any, on moose populations of increased food can be quickly negated by a by-product of logging, that is, roads. Moose populations are very vulnerable on their winter range because they tend to be aggregated and easily killed by hunters. So if moose populations are not limited by habitat or food, then providing more forage will not increase their numbers and increased mortality due to access could cause population declines.

Riparian habitats are key to moose survival in SE Yukon, and these watercourses and associated habitats are vital to the entire landscape. Riparian ecosystems function as connectors, corridors which transmit water, nutrients, plants and animals. These areas tend to be the most productive, have the best soils, the biggest trees, and the highest biological diversity. To illustrate, in Oregon it was calculated that while riparian areas comprised only 6% of the landscape, they were disproportionately important to a number of forest resource uses:

Fisheries	100%
Bird Species Feeding	74%
Mammal Primary Habitat	58%
Large Mammal Winter Range	13%
Plant Species	78%
Potential Timber Yield	4%
Developed Recreation	83%
Dispersed Recreation	76%
Wilderness Recreation	49%

(taken from Riparian Management in B.C. by Stevens et al.)

Intensive timber harvesting may reduce these systems' ability do deliver these other "goods". If riparian systems are functionally impaired then there will be consequences throughout the entire landscape.

It is apparent that riparian systems are key to and are used by many species. But we should not forget upland habitats. As logging moves into the upland forests there can be conflict with other species, notably, woodland caribou. Logging is beginning to encroach on the winter range and migration routes of the Little Rancheria Caribou Herd near Watson Lake.

Caribou are usually considered to be an animal that does not benefit from logging because of their dependence on lichens which occur in mature forests, their sensitivity to disturbance and habitat fragmentation and their need for large ranges, only a portion of which they use at any one time.

We are currently doing weekly aerial surveys to map the distribution and habitat use of the herd on their winter range. We may do additional work this summer to learn more about the quality and quantity of the range. Somehow we will then need to integrate this information with Forestry's cutting plans and come up with measures to protect the habitat of the herd. The mechanism for this type of integration is as yet undetermined.

If we are not able to integrate the needs of the caribou into the plans of other resource users, there is a danger of losing the Little Rancheria caribou herd; they will disappear as have so many woodland caribou herds in the south. Perhaps some people would consider this loss as an acceptable trade-off. But there is a danger in under-valuing Nature's creatures and processes. To illustrate, I will end with the story of the squirrel and the fungus.

This example has been borrowed from Chris Maser's book The Redesigned Forest. He uses the flying squirrel, an animal that also lives in Yukon's forests, but the red squirrel or red-backed vole or perhaps other small mammals could play a similar role. All of these animals are known to eat various kinds of mushrooms or fungus. Some types of fungus, commonly called truffles, have underground fruiting bodies. Most of these types of fungus are mycorrhizal, that is, they form a symbiotic relationship with plant roots. Mycorrhizal fungi absorb nutrients and water from soil and move them into the tree roots. In turn, the tree provides sugars from its photosynthesis to the mycorrhizal fungi. The fungi are more effective at nutrient absorption than are the tree roots. The mycorrhiza also contain nitrogen-fixing bacteria which are used by both the fungus and the tree.

The fruiting bodies of mycorrhizal fungi are attractive food to flying squirrels and other small mammals. These bodies contain nutrients, water, fungal spores, nitrogen-fixing bacteria and yeast. When the squirrel eats the fruiting body, the fecal pellets it excretes contain the spores, yeast, nitrogen-fixing bacteria and other nutrients. These components together are a powerful little package that promote the growth of a new fungus. The animals drop their feces all over the forest, some of which will fall in favourable places to inoculate new tree roots with fungus or add new genetic material to an existing mycorrhizal fungus.

The relationship among the trees, fungus and squirrels is complex. Not long ago squirrels and other small mammals were considered detrimental to the human-designed forest because they ate tree seeds and sometimes seedlings. Now it turns out that squirrels may be integral to the growth of trees and the health of the forest.

Yukon stands on the brink. We can liquidate the trees in the next few years or we can go more slowly, carefully and plan for the future of the forest and all its inhabitants.

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YUKON FORESTS FROM A BIRD'S-EYE VIEW

by

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Background

Birds account for the greatest proportion of vertebrate diversity in the Yukon forests. In southern Yukon many forest birds are at the northern edge of their range and therefore have a limited distribution. However, the distribution of species east of the Liard River is not well known at this point. Most of these birds are migratory, spending the breeding season in the north and wintering as far south as South America. Many species of birds are directly dependent on forests for nest sites and food (Table 1).

Birds are an important component of the forest ecosystem as insect feeders, prey (for both birds and mammals), seed dispersers, and predators. Insectivores are especially important in forest management as they may depress insect outbreaks, or extend the period between outbreaks (Cline et. al. 1980). Eggs and nestlings are prey to mice, squirrels, weasels and marten while adult birds are prey to hawks and owls.

Several North American species that require forest habitats are exhibiting declining population trends. Many of the species which overwinter in Central and South America are experiencing loss of forest habitat as agriculture expands into the rainforest (Terborgh, 1989). Some species are experiencing loss of habitat on their migration routes and breeding grounds as well. It is difficult to sort out the relative importance of each of these changes at the population level. The species exhibiting declining trends tend to be those requiring large territories or habitat specialists (eg. Great Gray Owl, Least Flycatcher). The species exhibiting increasing trends tend to be habitat generalists (eg. American Robin, Lincoln's Sparrow) (Dunn, 1991; Downes and Dunn, 1994). Habitat requirements of specialist species in particular should be considered in forest management plans.

An additional problem for many migrant songbirds is the expanding range of the Brown-headed Cowbird (Robinson et. al. 1992). This bird prefers open habitat and its range expansion is related to human activities such as land clearing for settlement and agriculture. It is a nest parasite that lays eggs in the nest of other birds - usually near a forest edge. The unsuspecting hosts will raise a cowbird chick at the expense of their own offspring. Increasing the amount of forest edge with clearcuts has the potential to increase the exposure of forest bird species to nest parasitism, if food is not a limiting factor for adult cowbirds (Robinson et. al. 1992).

Early and Late Successional Habitat

The distribution and productivity of some species of forest birds is regulated by fire or other disturbances (windthrow, snow loading, alluvial disturbances) that "create" early successional habitat ie. shrubs and deciduous trees. These "islands" of habitat must be maintained both geographically and temporally if local wildlife populations are going to be maintained over the long term (Rotenberry et. al. 1993). The smaller and more dispersed the habitat patches, the less likely they are to be recolonized (Thompson et. al. 1993).

Depending on the silvicultural method used, the early successional stages following logging can create open shrubby habitats that are used both by shrub specialists (excluding riparian shrub specialists) and generalist species. A recent study done in Idaho found that several species were more abundant in watersheds that had some logging, compared to neighboring watersheds that were not logged. In the same study, the "forest interior" species were less abundant in watersheds that had been logged (Evans and Finch, 1993).

Franklin (1989) points out the importance of retaining the early and late successional stages of a managed forest. Early successional species tend to fix soil nutrients (Lupine and other legumes, Alder), and maintenance of later stages provide habitat for both vertebrates and invertebrates, as well as organic material which contributes to long term site productivity. Harvest strategies that create mixed stands in terms of species and age ensure that the functions associated with early and late succession are retained (Franklin, 1989). Historically, mixed stands were replaced with even aged stands of a single tree species. In Sweden, comparisons of a natural forest with a single tree species plantation of similar age showed that total bird density was 3 times higher in the natural forest and species diversity was greater in the natural forest (Nilsson, 1979). Even-aged single species plantations provide limited habitat to species which may have traditionally inhabited an area.

Later successional stages typically have standing dead (snags) and decaying live trees of different ages and species throughout the forest. Several studies have indicated the importance of maintaining these "wildlife trees" in managed forests (Hejl and Woods, 1991; Cline et. al. 1980; Franklin et. al. 1989). In Yukon forests, wildlife trees provide habitat for 22 species of birds including 2 owls, 2 small falcons, 7 woodpeckers, 2 swallows, 3 chickadees, 1 bluebird, 1 nuthatch and 4 ducks. If populations of these and other forest birds are to be maintained, their habitats must be maintained as well.

Riparian Habitat

Some bird species prefer riparian shrub habitat adjacent to streams, rivers, lakes or ponds. Others species may nest in upland areas, but the juveniles move into riparian areas after fledging (Machtans, 1995). A study of riparian habitat in coniferous forest in Quebec has shown that the wider the riparian buffer the greater the diversity of species that is retained (Darveau and Huot, 1993). Another study comparing floodplain and upland forest habitats found a higher density of breeding birds in the floodplain (Stauffer and Best, 1980). This makes intuitive sense when you consider that wetter habitats tend to be more biologically productive than dry ones.

The importance of riparian areas has been recognized both for maintaining quality aquatic habitat and quality wildife habitat. Most forestry regulations require buffers along water courses. The draft "Riparian Field Guide" (1994) for B.C. furthermore recognizes the importance of the "zone of riparian influence" and recommends riparian management areas that consist of a "reserve zone" adjacent to the watercourse and a "management zone" beyond. This approach is more appropriate for management of sites where riparian habitat extends beyond a buffer zone of a set width.

Ecosystem Based Forest Management Models - One Example

What is the best approach for forest management in Yukon that will maintain, restore or enhance habitat for forest birds and other wildlife? In order to answer this question we require additional baseline information on the distribution and habitat requirements of wildlife species. While this information is being compiled, the most appropriate available information should be used to develop an ecosystem based forest management plan. The following is one example of a management model.

The model that B.C. has legislated with the new "Forest Practices Code of B.C. Act" involves comprehensive planning exercises from a broad regional scale down to individual stands. The overall objective is to foster ecologically based forest stewardship. This will be realized through establishment of:

1. broad landscape unit objectives.
2. forest ecosystem networks within a landscape unit.

3. management practices that provide important ecosystem attributes at the stand level.

From a wildlife point of view, the standards and regulations that support B.C.'s forest practices "Code" are encouraging in that they aim to maintain or restore diverse and productive habitats over the long term. However, as Yukon forests are slow growing relative to B.C., a more conservative approach may be necessary to ensure the continuity of diverse and productive forest habitats and the wildlife populations which they support.

Table 1. BIRD SPECIES FOUND IN YUKON FORESTS		
Location: S=south, C=central, SE=southeast, SC=southcentral, Yukon=Yukon wide		
SPECIES	**LOCATION**	**NESTING HABITAT**
Barrow's Goldeneye	S, C	Cavity (tree)
Common Goldeneye	S, C	Cavity (tree)
Bufflehead	S, C	Cavity (tree)
Common Merganser	S, C	Cavity (tree)
Hooded Merganser - rare	S	Cavity (tree)
Solitary Sandpiper	S, C	Tree
Bonaparte's Gull	S, C	Tree (conifer)
Osprey	S, C	Tree, Snag
Bald Eagle	S, C	Tree
Red-tailed Hawk	S,C	Tree (conifer, deciduous)
Sharp-shinned Hawk	S, C	Tree (conifer)
Northern Goshawk	S, C	Tree
American Kestrel	S, C	Cavity (tree)
Merlin	Yukon	Tree, Cavity, Cliff
Ruffed Grouse	S, C	Ground
Spruce Grouse	S, C	Ground
Blue Grouse	S, C	Ground
Willow Ptarmigan	Yukon	Ground
Rock Ptarmigan	Yukon	Ground
Ruffed Grouse	S, C	Ground
Sharp-tailed Grouse	S, C	Ground
Mourning Dove - rare	S	Tree
Great Horned Owl	S, C	Tree

Northern Hawk-Owl	S, C	Cavity (tree or snag)
Great Gray Owl	S, C	Tree
Common Nighthawk	S	Ground
Belted Kingfisher	S, C	Cavity (bank)
Yellow-bellied Sapsucker	SE, SC	Cavity (tree or snag)
Downy Woodpecker	S	Cavity (tree or snag)
Hairy Woodpecker	S, C	Cavity (tree or snag)
Three-toed Woodpecker	S, C	Cavity (tree or snag)
Black-backed Woodpecker - rare	S	Cavity (tree or snag)
Northern Flicker	Yukon	Cavity (tree or snag)
Pileated Woodpecker - rare	SE	Cavity (tree or snag)
Olive-sided Flycatcher	S, C	Tree (conifer)
Western Wood-Pewee	S	Tree (conifer)
Yellow-bellied Flycatcher - rare	S	Ground
Alder Flycatcher	Yukon	Shrub
Least Flycatcher	S	Tree, Shrub (mixed)
Hammond's Flycatcher	S, C	Tree, Shrub
Say's Phoebe	Yukon	Cliff (shelf)
Eastern Kingbird - rare	SE	Tree, Shrub
Tree Swallow	S, C	Cavity (tree or snag)
Violet-green Swallow	S, C	Cavity (tree or snag)
Rough-winged Swallow - rare	S	Cavity (bank)
Gray Jay	Yukon	Tree
Black-billed Magpie	S, C	Tree, Shrub (open woodland)
Common Raven	Yukon	Cliff, Tree
Black-capped Chickadee	S	Cavity (tree or snag)
Mountain Chickadee - rare	S	Cavity (tree or snag)

Boreal Chickadee	Yukon	Cavity (tree or snag)
Red-breasted Nuthatch	S	Cavity (tree or snag)
Mountain Bluebird	S, C	Cavity, Tree
Townsend's Solitaire	S, C	Ground, Cavity (base of tree)
Gray-cheeked Thrush	Yukon	Tree, Shrub, Ground
Swainson's Thrush	S, C	Tree, Shrub
Hermit Thrush	S, C	Ground
American Robin	Yukon	Tree, Shrub
Varied Thrush	Yukon	Tree
Golden-crowned Kinglet	S	Tree (conifer)
Ruby-crowned Kinglet	S, C	Tree (conifer)
Bohemian Waxwing	Yukon	Tree (conifer)
Northern Shrike	Yukon	Tree (open woodland)
European Starling - rare	S	Cavity
Warbling Vireo	S	Tree (deciduous)
Solitary Vireo - rare	SE	Tree (conifer)
Tennessee Warbler	S, C	Ground (woodland)
Orange-crowned Warbler	S, C	Ground (open deciduous)
Yellow Warbler	Yukon	Shrub
Magnolia Warbler	SE	Tree (conifer)
Cape May Warbler - rare	SE	Tree (conifer)
Yellow-rumped Warbler	Yukon	Tree (conifer)
Townsend's Warbler - rare	SW	Tree (conifer)
Palm Warbler - rare	S	Ground (shrubs)
Blackpoll Warbler	Yukon	Tree (conifer)
American Redstart	S	Tree, Shrub (deciduous)
Northern Waterthrush	Yukon	Cavity (ground or stump)

MacGillivray's Warbler - rare	S	Shrub
Common Yellowthroat	S	Shrub, Ground
Wilson's Warbler	Yukon	Ground (shrub cover)
Western Tanager - rare	SE	Tree (conifer)
Brown-headed Cowbird	SE	nest parasite (open)
Pine Grosbeak	Yukon	Tree (conifer)
Evening Grosbeak - rare	SE	Tree (conifer, deciduous)
Purple Finch	S	Tree
Red Crossbill	S	Tree (conifer)
White-winged Crossbill	Yukon	Tree (conifer)
Common Redpoll	Yukon	Tree, Shrub
Pine Siskin	S, C	Tree (conifer or mixed)
American Tree Sparrow	Yukon	Ground, Shrub
Chipping Sparrow	S, C	Tree (edge)
Clay-colored Sparrow - rare	S	Shrub
Le Conte's Sparrow - rare	SE	Ground
Fox Sparrow	Yukon	Ground (shrubs)
Song Sparrow - rare	S	Ground (shrubs)
Lincoln's Sparrow	S, C	Ground (shrubs)
White-throated Sparrow	SE	Ground (open woodland)
White-crowned Sparrow	Yukon	Ground (shrubs)
Dark-eyed Junco	Yukon	Ground (open or mixed)

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SOUTHEAST YUKON FOREST BIRD PROJECT, 1994 - PRELIMINARY RESULTS

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INTRODUCTION

Much of Yukon's most productive forest is situated in the Liard River valley, in the southeastern area of the territory. The forest habitats adjacent to the Liard River and its tributaries are among the territory's most productive for wildlife as well as plant life. About 70% of the vertebrate species found in these forests are birds. Several bird species which breed in southeast Yukon are at the northwestern edge of their range, and are not found elsewhere in the territory. Despite the importance to Yukon bird life of riparian forest in the Liard valley, very little is known about the habitat associations and local ecology of forest birds in this area.

The old-growth riparian forests of the Liard valley are being rapidly depleted by clearcut logging. With planned rotation ages of 90-100 years (Kaska Forest Resources Ltd., 1993), the old-growth forests which are now being logged will not be replaced. Currently, it is not known what effect this will have on forest bird communities. Since forest birds serve important functions as seed dispersers, prey for wildlife, predators of insects, etc., damage to local forest bird populations may in turn result in damage to the forest itself.

Our study examines bird-habitat associations in the Liard River valley. The results improve our knowledge of forest birds in southeast Yukon and will provide guidance for ecologically-based long-term forest management in the area. Here we present some preliminary results; a detailed report will be published elsewhere.

Methods

In order to describe the forest bird community in the Yukon section of the Liard River valley, we identified seven habitat types (Table 1) and surveyed birds in each. Overall, 147 census points were chosen, and each was surveyed twice (once in early June and again in late June). For each point count, one observer stood at the census point for 10 minutes and recorded every bird detected within 75m by sight or sound. Point counts were conducted between 4:00 and 9:00 am.

Data for each species were summarized by taking the higher total from the two replicate counts at each census point (ie. early June or late June), and calculating the mean of these totals over all points in each habitat type. The resulting figure was the mean number of birds detected per census point, for a particular species in a particular habitat type.

Birds which did not exhibit a direct association with the surveyed habitat (eg. birds flying over well above the canopy) were excluded from further analysis. Groups of species, such as ducks, raptors and shorebirds, which are not effectively surveyed using point counts, were also excluded from further analysis.

In order to describe the habitat characteristics of each of the seven habitat types, we measured vegetation parameters at 102 of the 147 census points. These vegetation data will be presented elsewhere.

Preliminary Results

A total of 1375 detections of 51 species were made during the 294 point counts (Table 2). Taking the maximum number of detections per point (over the two replicate counts) as an estimate of the actual number of birds gives a total of 1224 individuals. The total number of species detected in a particular habitat type ranged from 16 species in Cutblocks to 37 species in Riparian; and the mean number of birds (all species combined) detected per point ranged from 2.9 birds/point in Cutblocks to 9.8 birds/point in Riparian (Fig. 1).

Some bird species were fairly evenly distributed throughout most or all habitat types, while others were found predominantly in one or a few habitat types. The former are habitat generalists, while the latter are habitat specialists. For example, Yellow-rumped Warbler, Swainson's Thrush and Dark-eyed Junco were present in relatively high numbers in most habitat types (Fig. 2), while Golden-crowned Kinglets and Three-toed Woodpeckers were predominantly found in mature White Spruce forest and Least Flycatchers were found only in Riparian and Balsam Poplar forests (Fig. 3).

Eight of the species detected in this study are rare in the Yukon, or their distribution in the territory is limited to the southeast. An additional three species, which are limited to southeast Yukon, were observed in the study area but not detected during point counts. Twelve species which were detected in this study are experiencing population declines in at least part of their range in Canada (Dunn, 1991). Eleven species were detected which nest in cavities in dead or decaying trees; cavity nesters were most abundant in mature White Spruce forest (Fig. 4).

Discussion

Current forest management plans for the Liard valley call for replacing most of the area's old-growth forest with younger forest, using a 90 to 100 year rotation (Kaska Forest Resources Ltd., 1993). Presently, there are very few examples of younger forests in the area. The old-growth forest which has been cut has been replaced by shrubby clearings, some of which have been site-prepped and planted with White Spruce in the last two or three years. Although some sites in the area were clearcut as long as 30 years ago, there are virtually no 10- to 30-year-old conifer stands at present. As a result, comparisons cannot be made between bird communities in stands of different ages.

Studies conducted elsewhere have shown that bird communities change radically with forest age (eg. Morgan and Freedman, 1986; Eckert et al., 1992). The results of this study show that when old-growth White Spruce forest is removed (all of the cutblocks we sampled had been old White Spruce stands), many of the birds associated with old-growth White Spruce (eg. Golden-crowned Kinglet, Three-toed Woodpecker, and Red-breasted Nuthatch) disappear. It is unknown at what age the second-growth forest would begin to support these species again, but it is likely that some species would fail to return in their former numbers within 90 or 100 years. In general, bird communities in rotation-aged forests are quite different from those in old-growth forests of similar tree species composition (eg. Mannan and Meslow, 1984; Hejl and Woods, 1991).

Our results for the density and diversity of birds found in Riparian forest show that habitats immediately adjacent to rivers are important for birds, and that many species which use riparian shrubs do not use shrubby clearcuts. This underscores the need for adequate riparian buffer strips of shrubs and intact forest along all watercourses, including backchannels.

Bird species which are most likely to be negatively affected by the loss of old-growth forest in the Liard valley are those which are (a) habitat specialists, (b) at the edge of their range, (c) cavity nesters, or (d) experiencing population declines elsewhere in Canada. Forest management in the area should attempt to preserve the original assemblages of bird species, with special attention paid to those species which may be particularly at risk for the above reasons.

The point count method used in this study is an effective way to survey songbirds. Further study is needed in order to identify habitat needs of other forest birds such as owls, hawks, and grouse. In addition, further study is needed in order to identify forest management practices which will maintain the habitats required by forest birds. In particular, the effects on birds of different harvest methods, including alternatives to clearcutting, should be examined, and critical habitat within the Liard River valley should be identified and preserved.

Similar studies should be conducted in other areas of southeast Yukon, in order to determine whether bird-habitat associations found in the Liard River valley are consistent throughout southeast Yukon, and to assess the relative importance of the Liard River valley for Yukon's forest bird populations.

Acknowledgements

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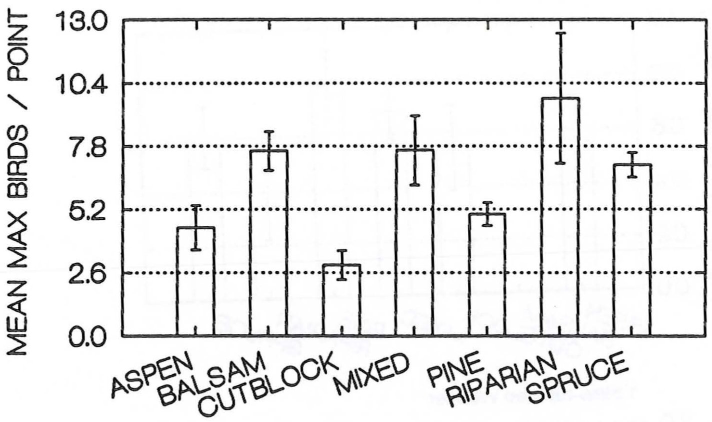

Fig. 1. Mean number of birds per point in each habitat type, all species combined.

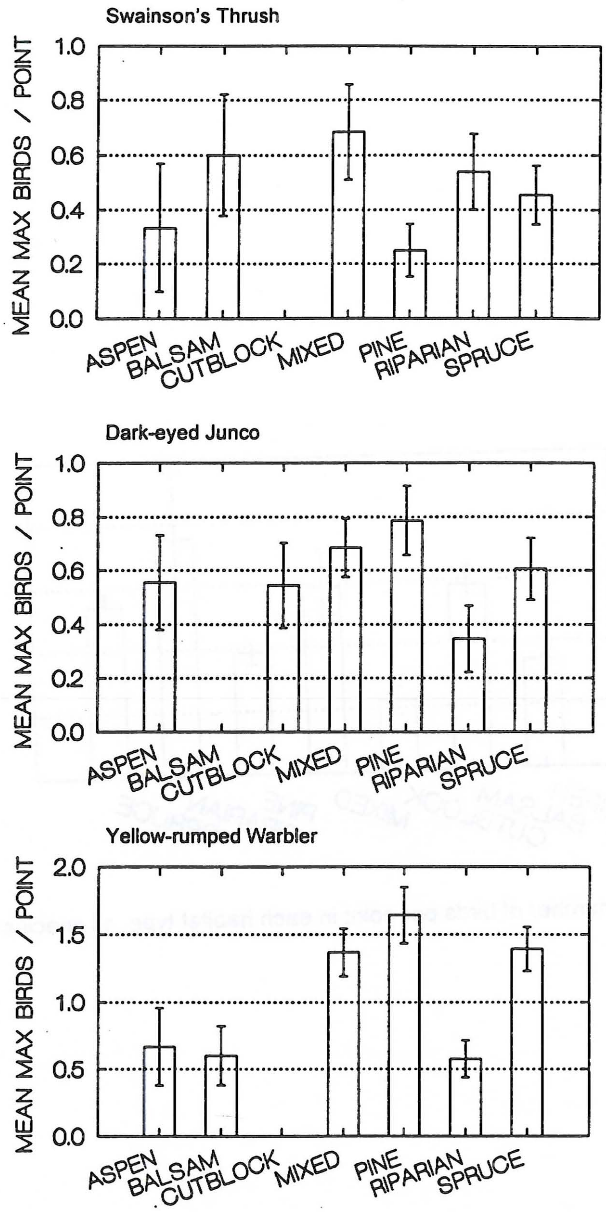

Fig.2. Mean number of birds per point in each habitat type for three "habitat generalist" species.

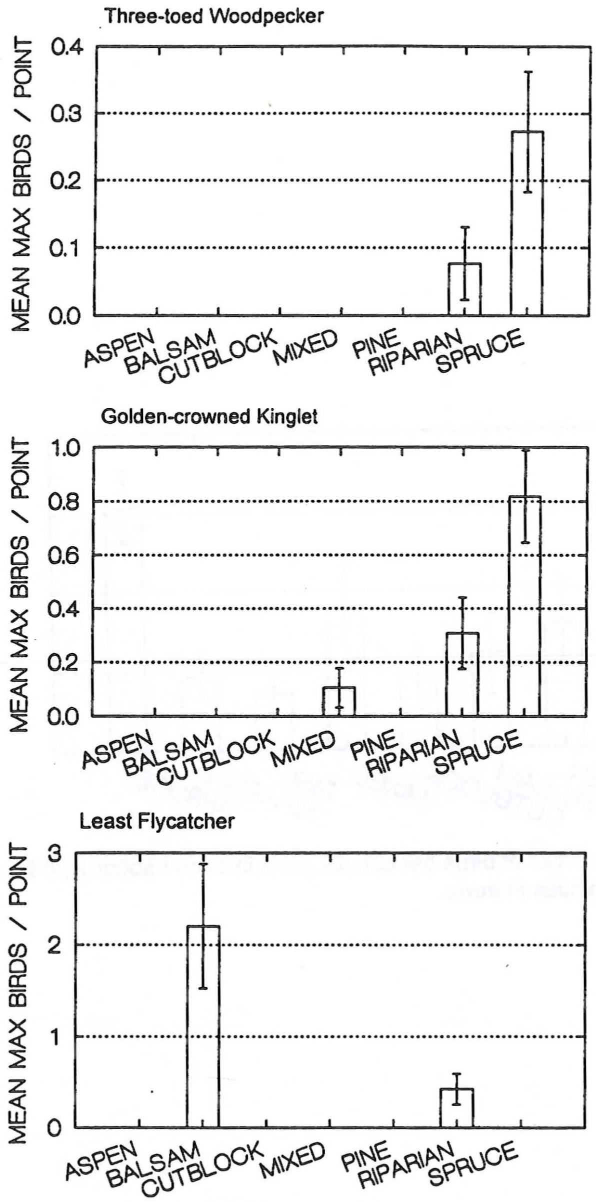

Fig.3. Mean number of birds per point in each habitat type for three "habitat specialist" species.

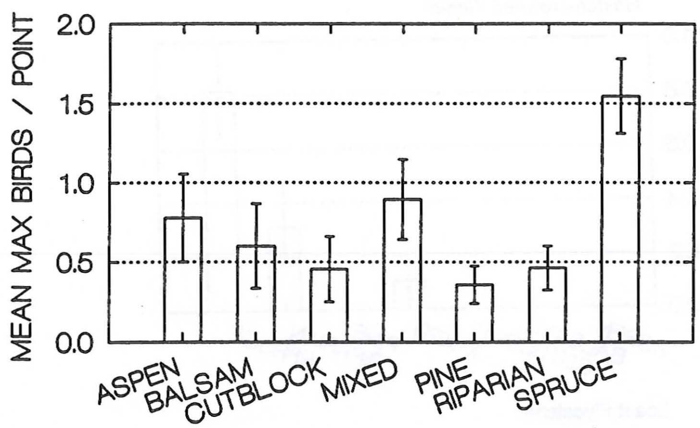

Fig. 4. Mean number of birds per census point in each habitat type for species which nest in cavities in trees.

Table 1. A total of 147 census points were established in seven habitat types.

Habitat Type	Number of Points
Trembling Aspen Forest	9
Balsam Poplar Forest	10
Lodgepole Pine Forest	28
White Spruce Forest	33
Mixed Forest	19
Riparian	26
Cutblocks	22
Total	147

Table 2. Fifty-one species were detected, including eight species which are rare in the Yukon and/or limited to southeast Yukon (status=r); 12 species which are experiencing population declines in part of their Canadian range (status=d); and 11 species which nest in cavities in trees (status=c).

STATUS			SPECIES (N=51)	TOTAL
			Yellow-rumped Warbler	195
			White-winged Crossbill	179
			Chipping Sparrow	102
			Dark-eyed Junco	99
	d		Swainson's Thrush	68
c			Boreal Chickadee	62
			Warbling Vireo	56
			Hammond's Flycatcher	54
		r	Golden-crowned Kinglet	52
			Ruby-crowned Kinglet	51
	d		Least Flycatcher	49
	d	r	White-throated Sparrow	39
			Bank Swallow	38
c	d		Yellow-bellied Sapsucker	35
			Gray Jay	34
	d	r	American Redstart	26
			American Robin	26
			Lincoln's Sparrow	17
		r	Tennessee Warbler	17
			Alder Flycatcher	14
		r	Magnolia Warbler	14
	d		Northern Waterthrush	14
			Varied Thrush	13
			Red Crossbill	11
c			Three-toed Woodpecker	11
			Pine Grosbeak	10
			Spotted Sandpiper	10
			Bohemian Waxwing	9
			Pine Siskin	7
c	d		Red-breasted Nuthatch	7
c	d		Northern Flicker	6
	d		Wilson's Warbler	6
c			Mountain Bluebird	4
			Ruffed Grouse	4
			Spruce Grouse	4
			Yellow Warbler	4
c			Common Goldeneye	3
c			Common Merganser	3
c			Hairy Woodpecker	2
			Purple Finch	2
			Solitary Sandpiper	2
	d		White-crowned Sparrow	2
c			American Kestrel	1
			Common Raven	1
	d		Common Yellowthroat	1
		r	Greater Yellowlegs	1
			Hermit Thrush	1
			Lesser Yellowlegs	1
		r	McGillivray's Warbler	1
c	d	r	Winter Wren	1
			Western Wood-Pewee	1
11	12	8	TOTAL	1370

COMMUNITY LAND MANAGEMENT & ETHIC
ACHIEVING A BALANCE

by

Garry Merkel

INTRODUCTION

This paper describes a system of land care that is directed by the collective wisdom of the community, and grounded in a spiritual reverence for the land. This perspective is based on the experience of the author, Garry Merkel, and is also biased by the author's sense of idealism. Two definitions that are fundamental to understanding the concepts in this paper are:

1. **Land ethic** refers to an individual's, or group's, ethical understanding of their relationship to the land. This land ethic is not automatically a reverent thing as we are often lead to believe. Each of us has a land ethic, and our personal land ethic stems largely from our society's collective land ethic. Ethics come from value-based moral judgements, some of which are conscious but many of which come from the sub-conscious. These values generally include reverence, spiritual, humble and a host of other idealistic terms when discussed at a conscious level, but these values often contain fear, apathy, indifference and a number of other not so idealistic terms when looking below the surface to the sub-conscious. As individuals we may despise the way our society is using (or abusing) the land, but each of us is generally just as trapped as others in our society in the collective land ethic. Developing a deeper and more grounded land ethic is a constant process of uncovering, and facing these sub-conscious patterns.

> ***Land Ethic:*** *An individual's, or group's, ethical understanding of their relationship to the land.*

2. **Community land management** refers to a community using its own self -built organizations, systems and processes to look after land. Community land management is not a utopia as we are often lead to believe. Each community land management framework is an extension of the community that created and uses it. The collective land ethic of the community, plus the effectiveness of the community participation processes at a given point in time determine the nature, functioning and growth ability of the community's land management framework. Building and adapting its land management framework is a constant and evolving process.

> ***Community Land Management:*** *A community using its own self - built organizations, systems and processes to look after land.*

The overall process is one of a community striving to achieve an ethic that comfortably balances its perceived needs with the degree of harm to the land. This is a process of mutual evolution. As land ethic evolves, the standard of land care increases which causes a deeper understanding of land and further evolution of the community's land ethic. During a typical evolutionary cycle, the community:

1. faces its demons (inherent disrespectful treatment of the land);

2. goes through a period of guilt and blame;
3. re-shapes (or renews) its land ethic to overcome the guilt and to provide a new and stronger morale base to work from;
4. modifies its land management practices to reflect its new understanding; then
5. faces more demons.

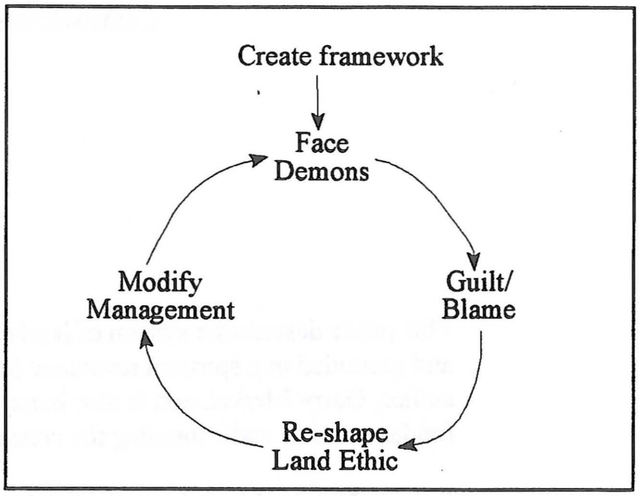

Figure 1: Evolutionary cycle

It is impossible to describe every situation where a community is setting up land management. Each situation is different because each community is different. While each community's management system should be ecologically compatible with surrounding systems, the specific details which each system must be determined primarily by the community.

This paper describes the features of a community land management framework that is based on a spiritual land ethic, more specifically, the rest of this paper discusses:

1. The nature and properties of an earth-based spiritual land ethic.

2. A generalized planning model that a community can use as a base template for planning a process to establish their own community land management regime.

3. What elements of the community land management framework (e.g., organizations, processes, systems) might look like in a society that is grounded in the earth-based spiritual land ethic discussed earlier.

The reader must understand that these ideas and concepts are based on the experience and ideals of the author. They are only one perspective, and as such, must be seen as one building block when building your own land management framework. Ideas and concepts simply set the stage. Reality and situation determine what should, and will, happen.

LAND ETHIC

As discussed earlier, land ethic is an individual's, or group's, understanding of their ethical relationship to the land. This can be spiritual, fearful, indifferent, good, bad or whatever. It is a personal thing like any other value-based or religious belief. This section will describe the:

1. differences between dominant land ethics;
2. nature and properties of an earth-based spiritual land ethic, and
3. resulting behaviours in a society which follow an earth-based spiritual land ethic.

A spiritual land ethic is primarily found in indigenous earth-based societies, but it is not exclusive to those societies. Skin colour may be a significant indicator, but the predominant determining factor between different land ethics is how the society, and individuals within the society, deal with their fear of the unknown. Spiritual land ethic societies cannot be determined by skin colour, physical location, income level, education, religion or any other man-made boundary. These societies may be concentrated in specific areas or scattered and intermixed over broad areas. They may come from a single tribal group or a mixture of various ethnic origins. The primary point being that this thinking does not belong exclusively to any one group.

Understanding, and identifying, different land ethics requires an understanding of the root of their differences. This root, the same root that determines all land ethics, is how the society deals with its fear of the unknown, or in simpler terms, how the society gains its spirituality. Spirituality being the means that society uses to gain comfort in the fact that we are infinitely small, in a place that we know little or nothing about. Native American medicine wheel religions describe this as how we deal with our fear of loneliness.

When a society has difficulty dealing with its fear of these unknowns (and the accompanying loneliness), its inherent tendency is to create smaller and more defined spaces that it's members can eventually fit into comfortably, e.g., romantic love, countries, religions, income levels. This society creates its sense of control and power (to overcome its fear) by:

- attempting to master the world;
- defining spiritual realms in its own image; and
- building its strengths by creating weaknesses in others.

This can be generally characterized as an inherently fearful land ethic.

When a society deals with the unknown by accepting its place (smallness) and worshipping all other life that is here with it, the need for control drops out of its existence. All aspects of society become an extension of that society's quest to fit into its place. This society may fight for survival, but its actions are grounded the understanding that the greatest honour comes from counting coupe. The basic spiritual needs of finding comfort in the unknowns are met by:

- accepting and relishing your smallness and loneliness;
- accepting your lack of understanding and power; and
- worshipping the forces that brought us into this rich and diverse movement.

> ***Counting coupe:*** *The native American practise of "touching" the enemy without being harmed. This was often done by riding singlehandedly into the enemy ranks, taking something of value and returning to your ranks without being harmed.*

This can be generally characterized as a spiritual land ethic.

Some beliefs, properties and practices of an earth-based spiritual land ethic, and the societies that practise it, include:

Religious/spiritual: Earth-based societies are characteristically extremely spiritual and structured (religious) in all aspects of life. Individuals, families, clans, societies, governments, traditions, business transactions, weddings, sharing and all other social structures and interactions are extensions of, and include symbols or ceremonies tied to, the society's shared land ethic.

Fallible: While living in your smallness provides an extremely powerful spiritual base, most earth-based societies understand, create ceremonies around, and find humour in the fact that they are extremely fallible and continue to make foolish mistakes.

Language: Languages in these societies are often very different. Everything is communicated in terms of movement and connection (similar to verbs but more deeply connected). Nouns and objects generally do not exist, but almost all earth based societies have more than one "name" to describe almost everything. Each of these "names" is a description of how the item fits in the world. Some "names" are weak, i.e., they describe shallow connections, and some "names" are powerful, i.e., they capture deeper connections. One word can capture an entire history in a single movement. These types of words are very powerful and are only taught to, or come to, those who are in tune enough to accept the responsibility of being their guardian.

Destiny oriented: Many concepts like philosophy, believe or dream do not exist in most earth based societies. You are born to a path. Each person's purpose is to follow their path and achieve their spiritual potential.

Collective wisdom: In earth-based societies, each person is seen to be the centre of the universe and a reflection of the entire universe, but at the same time, only has one perspective. By bringing all perspectives to the circle, the collective makes decisions grounded in its's cumulative wisdom. These decisions often take longer to make, but they invariably last longer. Elders are those who can often get past collective confusion to the simple and obvious truth. A note to the reader - making decisions based on collective wisdom is very different than the current fashionable process of consensus decision making.

Whole and diverse: Earth-based societies see the world is a whole. Attempting to make it anything less than a whole is to take away from it, and thus take away from yourself. At the same time that it is whole, it is also incredibly diverse with many balancing forces. Flowers, religions, rocks, people, governments and all other things come in infinite diversity. Everything has an equal place in the whole.

Reality based: Earth-based societies understand that everything is what it is, i.e., reality. What is - is. As humans we have a tendency to try to create reality and to add value to everything in our environment. However, nothing is born, lives or dies with value. It is simply what it is in its place as a small part of the movement. It is only us who need to give it value, and in doing so, we fill our need to create a defined and comfortable place for ourselves.

Humility: Humility is simply understanding and living in your place. A foundation of earth-based society is to understand that everything has a place, and to religiously quest towards living in your place.

Respect: Respect is simply behaving as though other things have the same rights as you. Fundamental to earth-based societies is a deeply rooted respect for land, individual freedom of choice, family and all life.

Time: Time is measured differently than we are used to in most earth-based societies. The clock is based on what has to be done, and what has to be done is determined primarily by what is happening on the land and society's traditions, e.g., gathering, hunting, fishing, coming of age. These societies also see and understand long term cycles (e.g., over 1,000 years) which in turn fosters tremendous patience. Everything that needs to get done, gets done, just maybe not this minute.

Personal enlightenment: The notion of developing a success orientation is relatively foreign in most earth-based societies because each individual is born to, and expected to, follow her or his own path. Society understands that each individual must achieve their own understanding of the world through their own experience. From birth each individual is given the freedom to learn their own lessons and find their own path. Advice is offered, generally sparingly and only when asked, but each person must make their own choices based on their personal level of spiritual awareness.

One final note on spiritual land ethic. It is not a snapshot at a point in time, being the best, something that is owned, or something that is achieved and measured at points in time. It is the is religious pursuit of living in our place, where the path towards achieving spiritual balance with the land becomes our primary focus. Notions of right or wrong, success or failure, good or bad, sustainable or not sustainable become secondary to incremental enlightenment within this pursuit. Each person takes the path on their own, and the sum total of each individual's understanding makes up society's collective land ethic.

COMMUNITY LAND MANAGEMENT

Community land management, as described earlier, is a community using its own self-built organizations, systems and processes to look after land. A community land management framework includes all of the processes, systems, organizations, resources and other elements that a community uses to carry out its responsibility to look after the land.

Table 1 outlines a general planning model that might be followed to create a community land management framework. The entries inside the table are specific components that should be created as part of the overall framework. These components are roughly grouped under 5 headings (Land Management, Community Involvement, Organizational Development, Education & Training and Business Development). The order from top to bottom of the table indicates the general order that the components should be built.

	Land Management	Community Involvement	Organizational Development	Education & Training	Business Development	
↓	Land Base	Communications Strategy & Plan	Communications Network	Leadership		↓
↓	Inventory	Statement of Beliefs	Decision Making Authority	Public		↓
↓		Development Policy	(Management, contract agreements)	External		↓
↓		Vision	Working partnerships	Initial Worker Training		↓
T	Mapping	Community Development Strategy		Education Strategy	Business Strategy	T
I	Planning system	Zoning Standards			Pre-feasibility	I
M	Landscape analysis	Community Development Plan	Capital Development Plan	Training & Education Plan	Economic Development Plan	M
E	Zoning	Zone Procedures	Resource Centre	Ongoing Worker Training		E
↓		Preliminary User Targets	Training Centre	Public School Curriculum		↓
↓	Scheduling, Plans	Review & Ratification	Business Development Corporation		Feasibility	↓
↓	Implementation	Monitor, Feedback, Update	Resource Management Administration		Business Plans	↓
↓			Businesses		Business Development	↓

GEM Oct, 93

Table 1: Community Land Management - Implementation Process.

A few important points about this table include:

1. This planning process assumes that the community will create a primarily money-based economy. The individual components will be different if the community was developing a substantial barter-based economy.

2. Community land management contains is a number of inter-related components. The exact components, and the grouping of these components, must be determined for each individual community.

3. Creating a community land management framework requires a blending of various disciplines. These include community development, business planning, educational design, land management and probably other disciplines depending on the individual community's needs.

The following pages (table 2) provide a description of each component identified Table 1 including:

- specific tasks and products for each component; and
- variations of tasks and products in a community that is grounded in a spiritual land ethic.

Table 2: Components of Community Land Management Land Management Group		
Component	**Description**	**Ethic variations**
Land Base	Identify the land base that the community will manage.	Often corresponds to a traditional use territory with considerations for ecological boundaries (e.g. watersheds).
Inventory	Conduct a full inventory of all resources and uses of the land.	Generally includes all standard scientific inventories plus an additional cultural uses and sensitivities inventory.
Mapping	Map all aspects of the land.	Generally includes all standard scientific mapping plus additional maps for cultural uses, territorial boundaries and other community features. Symbols are often very representative of the entity they are intended to represent, e.g., animal silhouettes.
Planning system	Work with the community to develop an acceptable land planning system.	These planning systems often have 2 substantive differences from current land planning systems. First, they describe the land as a whole then determine resource uses within the context of what is right for the land. Second, the plans are based on full community direction from design to inventory to implementation.

Landscape analysis	Do an analysis of the landscape to identify patterns and sensitivities.	Generally includes additional analysis of animal patterns, historical event and cultural sensitivities based on scientific data plus equal or greater value placed on traditional ecological knowledge.
Zoning	Work with the community to zone the land base.	Generally include additional zoning for animal patterns and cultural uses. Also use the community to set acceptable procedures for each zone.
Scheduling, Plans	Plan and schedule land care, enhancement and resource uses.	Generally differ by planning and scheduling resource uses within the boundaries set in the overall landscape analysis.
Implementation	Implement the land care, enhancement and resource use plans.	Generally differ by involving the community in the implementation and updating process.

Table 2: Components of Community Land Management Community Involvement Group		
Component	**Description**	**Ethic variations**
Communications Strategy & Plan	Work with the community to develop specific plans to communicate all aspects of the land management process.	The community is a full and active partner therefore must be fully involved in creating communications processes.
Statement of Beliefs	This is a collective document that outlines the community's beliefs about how the land should be cared for, how people should be involved in the process and how the community should proceed in all areas. This document is one of the primary foundations of all further work.	Generally includes a number of non-scientific spiritually oriented terms and reflects the community's reverence for the land.
Development Policy	This is a collective document that outlines how the community is willing to proceed with resource development.	Generally says that we will do almost anything as long as it does not hurt the land.
Vision	This is a collective document that creates a picture for the community to work towards	The vision often reflects a spiritual reverence for the land. It often link ceremonial practices, health care and other aspects of the community directly to the land.

Community Development Strategy & Plan	This is a collective document which integrates all areas that have to be created in the community into one planning framework.	The community is integral to creating this document and it generally contains a number of additional elements that tie the community closer to the land.
Zoning Standards	Work with the community to create a set of rules that define zones that can be applied to the land to map sensitivities.	The community develops these standards with assistance from scientific experts. The standards include additional considerations for cultural sensitivities.
Zone Procedures	Work with the community to create a set of acceptable procedures for each zone (defined above).	Procedures are generally very gentle and rely on non-scientific treatments to heal the land.
User Targets	Determine the level of resource use the community wants to achieve.	These targets are ultimately limited by the capacity of the land rather than economics.
Review & Ratification	Have the community to review and ratify the land management plan.	Plans are often scrutinized to ensure that no piece of the land will be compromised.
Monitor, Feedback, Update	Establish a process where the community is directly involved in monitoring and updating the land management plan.	The community learns from its mistakes and shares the experience in order to build a strong base of collective wisdom.

Table 2: Components of Community Land Management
Organizational Development Group

Component	Description	Ethic variations
Communications Network	Establish a communications network.	The communications system reaches all people in the community, and includes design features that allow the community to accumulate wisdom over time.
Decision Making Authority	Establish a means for the community to direct land management.	Generally based on territories with identified families, clans or territorial residents responsible for ensuring their territory is cared for properly and their territory is integrated with surrounding territory's plans and use. Decision makers are often respected "elders" with some assistance from scientific experts.

(Management, contract agreements)	Establish a jurisdictional and funding agreement with outside governments.	Generally includes a number of words that reflect the primary objective of reverent land care versus a strong focus on economics, employment and development.
Working partnerships	Establish working partnerships (communications mechanisms, committees, working groups, etc.) with all involved outside parties.	Generally include additional parties such as Elder's Circles, Traditional Ecological Knowledge associations, etc.
Capital Development Plan	Create a plan that outlines all capital developments, usually over the next 5 year period.	Generally includes additional structures where the community can join together to "worship" the land.
Resource Centre	Build a centre where all parties (community members, outside government, companies. . .) can get information, and provide feedback, on any aspect of the community's land management.	This centre often doubles as a pseudo church where the community comes together to "worship" the land.
Training Centre	Build a centre where all training happens.	This centre is usually attached to the "church" identified earlier, is generally very close to the land and is designed so that the community as a whole can be a part of its function.
Business Development Corporation	Create a corporation that does all business development on behalf of the community.	This corporation is often fully publicly owned and accountable and is bound by a development policy that places the land's health above all.
Resource Management Administration	Create an organization and administration to carry out all land management work.	This organization often includes a number of community components, e.g., elder's circle, traditional knowledge branch. . .
Businesses	Create the businesses identified by the community.	Businesses are always bound by the over-riding principle that they must not harm the land.

Table 2: Components of Community Land Management
Education & Training Group

Component	Description	Ethic variations
Leadership	Educate community leadership about the overall process, outside influences (e.g., policy, companies, government, land management).	Leadership, with respect to land care, are chosen on the basis of their wisdom and are rarely chosen on the basis of a vote.

Public	Educate the community about the overall process, their role in the process and how they will be involved.	The goal is to create an environment that results in constant enhancement of collective wisdom.
External	Educate external parties about how the overall process and how they can work with the community.	There is little attempt to convert outsiders to your methods, but any amount of effort will be offered if they choose to follow this path.
Training & Education Plan	Develop a plan which outlines how the leadership, public, outside parties and workers will be educated.	Education, especially for workers, is very experiential and includes a predominant qualitative component. Understanding the land and your relationship to it are more important than having excess knowledge.
Worker Training	Train all workers required for all elements of the land management framework.	Workers include almost everyone in the community because everyone is a worker at some time, e.g., community mappers, monitors, decision makers. . .
Public School Curriculum	Create a public school curriculum to educate students about the overall process and their role as community members in the process.	The curriculum includes a strong and mandatory component that teaches the students how to live in a respectful relationship with the land.

Table 2: Components of Community Land Management
Business Development Group

Component	Description	Ethic variations
Business Strategy	Create a general strategy for business development within the community.	The strategy is based on the principle that businesses must not harm the land.
Pre-feasibility	Develop a potential list of business opportunities that the community might pursue.	The pre-feasibility list is created on the basis that businesses cannot harm the land. This list is further screened using a community venture selection process.
Economic Development Plan	Develop a plan that integrates with the community development plan and outlines how economic development will proceed.	The plan is based on no harm to the land.
Feasibility	Carry out specific feasibility studies for the short list of potential business opportunities.	Feasibility is based on environmental factors then economic factors. Potential opportunities are further screened using a community venture selection process.

Business Plans	Develop business plans for feasible and acceptable business opportunities.	Again, no harm to the land and the community may further screen using a community venture selection
Business Development	Establish feasible, acceptable, planned business ventures.	Ongoing monitoring to ensure that each business does not harm the land.

Table 2 is not meant to be inclusive. It picks up on the example planning model shown in Table 1, and provides some idea on how each component of this model would be structured in a community that is grounded in a spiritual land ethic. Fully describing each row of the table could fill a book, and there are many additional rows that could be added. However, this table provides an overview of a process and a way of thinking that a community can use as a basis to:

- plan for the creation of its land management framework; and
- to cultivate a desired collective land ethic over time.

Success will depend on the community's ability to adopt, but not be fixed in, the thinking behind the example provided.

CONCLUSION

Every model of community land management is unique because every community's collective land ethic and circumstances are different. Our individual and collective land ethic shapes every aspect of our lives. Understanding this is the individual's and community's, first step towards entering into a long term discipline to cultivate a spiritual land ethic over time.

This paper outlined the author's view on how a spiritual land ethic might be tied to community land management, but the reader must realize that this thinking is still at a very young stage. The thoughts and ideas may provide some direction but they should not be considered the answer. It is up to each person to take these thoughts beyond this stage.

The answers lie in continuously thinking towards the infinite future. It is up to each of us as individuals and communities to create, and religiously follow, a discipline that cultivates our land ethic in a spiritual and reverent manner over time. Others may choose to follow different paths but we must understand that they must reach an understanding just as we must. Forcing them is not the answer. Being a model, leaving a trail and providing advice when asked will hopefully assist their enlightenment process. However, if they destroy the world and take all of us with them we must stand in awe just as we would watching lemmings herd over cliffs. As we develop our own spiritual land ethic we gain deeper peace in this understanding.

Community land management can provide a means to accumulate wisdom and cultivate land ethic over time. It can also take the community down a path it never wanted to go. The direction that the process takes depends on the care, wisdom and long term view taken when building the pieces. Keep a vision of the infinite future, understand and savour your smallness, respect all others that are here with you in this smallness, set up means to accumulate wisdom, and accept your fallibility. These are all ingredients that give you an excellent chance of creating a model of community land management that will outlast your children's children's children's children.

Good luck in your pursuit.

QUESTION PERIOD

Topic: **Community Based Land Management**
Speaker: **Garry Merkel**

Q: Garry, I must first ask you, according to your belief system, am I allowed to challenge it?

A: Absolutely.

Q: I wish to do that, without giving offence, okay? I think what you have given us is a First Nations philosophy of our land use. I feel it has a fatal flaw in it. Let me explain. First Nations philosophy is based upon a tradition of hunting and gathering and a resource-rich society -- a resource-rich land. It was a very nice situation, but a few people and resources are rich. When you say that when you look after land with simple people, you look after land as a whole, I just don't buy into that because you reject outside planning. I would like to suggest to you that reality is something different.

I have just returned from China. When resources become limiting, as they are in the world -- very seriously limiting -- people go into another mode of thinking entirely. They go into a survival mode. They look after themselves, they look after their families, they are concerned about food. I have been to China and watched Chinese peasants destroying the environment around them because, if they don't, they will die. When that situation happens, the land ethic goes completely out the window. And that is what the world is facing. So, I suggest that your land ethic is not appropriate for the present circumstances of an exploding world population.

A: I agree with you, but where we are going is not appropriate, either. So, we are stuck between a rock and a hard place, aren't we? As I said before, this is not about some kind of golden cow we are looking for. It is obviously true that we have got way too many people in this world, and we use way too much for this world to sustain us. And we can rationalize it all we want, but that is what it basically comes down to. The reason we are having these kind of conferences is because we are scared shitless that we are going to kill ourselves.

The question is: how do you resolve that? How do we bring the collective together and start developing an ethic that will, over time, in fact, become sustainable? I will tell you something. It may end up that we may end up having to put in place some serious population controls, and start doing some very strange things in order to survive -- things that are completely contrary to the notions we believe in right now. I don't know. I have no idea. All I know is that the changes have to happen as a result of a way of thinking. They will be a blend of where we are living right now, with too many people, and all kinds of science, and all kinds of technology and tools, and of this kind of thinking. It is this kind of thinking that is the missing ingredient at this stage of the game. Maybe we can build fantastic technologies so that more of us can live here, and so that we can do more. But that kind of thinking just leads to more technology for more people, so we can live here. But I agree with you, Gordon. I agree with you, for a large part.

Q: I would like to backtrack to the slide about the riparian values in Oregon. As most you don't know, the ecosystem status in Oregon is quite a lot different than it is in Yukon. The suggestion that only four percent of the timber values in Oregon were contained in the riparian areas might be true. Oregon is probably one of the richest forest networks in North America. The last time I checked into the figures, it was the single largest producer of lumber in the continental United States on a regular basis.

I started my career in forestry in Oregon. I remember sitting on a stump one day and counting rings that were three rings to the inch. You won't see much of that anywhere in Yukon. My point, though, was that four percent of the timber values contained in the riparian areas in Oregon do not translate to the situation in Yukon at all -- on a magnitude of ten. The forest inventory work that Kaska did for their timber harvest agreement area showed that approximately 40 percent of the volume on the timber harvest agreement area was spruce, which is largely a lowland riparian area species. So, that is something to think about. We are not going to be able to compartmentalize the fact that there are very high timber values there, as well.

A: I just have one small thing here -- just to pick up on Gord's comment. It will only take me 30 seconds.

It is in response to this fellow's comments, too. I am not suggesting that we make the leap today. You saw what happened when they ripped the wall down, and when they disbanded the USSR. Society can only grow so fast, and it grows on the basis of each of us individually being able to cope with the change and being able to live in the change. What I am talking about is the pursuit.

I don't know if I'll be any better than I am right now -- at what I am trying to do toward this -- when I die, than I am today. I may be just as guilty as I am today. All I can really hope for, is that my kids will be better at this. Maybe we will have set up some systems that will learn to do this better, and that they will teach somebody else to do it. I really think that's how we have to do it. We are blending thinking, science and a whole kind of an ethic together. And that's the discipline we are working towards. We get confused. We think science is going to solve it. It is not going to solve it. That's all I have to say.

OVERVIEW OF THE YUKON FOREST INDUSTRY

by

Harry N.E. Holmquist

1. INTRODUCTION

It is my task to describe a snapshot of the Yukon forest industry as it stands today. The industry is most definitely undergoing change, even as we meet, and the snapshot has become a series of slides as it changed during the preparation of this paper.

Since I am immersed in the development of forestry in the Watson Lake area, that will bias my presentation somewhat. I must say, I was pleasantly surprised by my research into activity in other areas of the Yukon.

SLIDE

2. CURRENT STATUS

- **"Things are more like they are now than they ever were before." - Dwight D.Eisenhower**
-
- Timber statistics in this report provided by DIAND to December 31, 1994

2.01 Commentary:

Current status generally means to December 31, 1994, although some of the data is based on best estimates as all the facts were not available even 30 days after year's end.

The information contained in this paper is not without gaps and cannot be used as empirical evidence. We will focus instead on trends within the industry and relevance for today and the future.

My disclaimer is quoted from Dwight D. Eisenhower. (See slide)

SLIDE

3. YUKON FOREST INDUSTRY

April - December, 1994

■ Timber Production
- Sawlogs
- Fuelwood
- Roundwood (house logs)
- Other

■ Silviculture
- Scarification
- Seed collection
- Planting
- Surveys

3.01 Commentary:

The Yukon region falls within the boreal forest type. Most of the timber values are concentrated in the southern regions of the Territory. The two main commercial species are spruce and pine. The density and ages of the pine stands are testimony to the numerous forest fires that occur in this sparsely populated region of northwestern Canada.

Until very recently, pine has not been considered merchantable sawlog material, and spruce has been the sought after species. The best spruce stands grow along the riparian zones (river bottom valleys), consequently, Timber Harvesting Agreements encompassed these prime areas.

Since the last century, firewood has been an important component of the Yukon economy, first as fuel for the steam paddlewheelers that plied Yukon lakes and rivers, and more recently as fuel for home heating as a means of reducing the high cost of northern heating with imported fossil fuels.

Roundwood products include post and rail material for fencing, mine lagging, and whole logs for log building construction.

Northern nurseries and entrepreneurs also look to Yukon forests for transplantable trees for landscaping, Christmas trees, etc.

In the area of silviculture, 250 hectares is presently being scarified. That brings the total to about 775 hectares over the past 3 years. Approximately 500,000 seedlings were planted in the Watson Lake district in the past year. Specific training has occurred in the area of stand tending and thinning in the last year. As of this past year, we do have a stand in south-east Yukon that has been logged, scarified, planted, brushed and spaced.

SLIDE

4. COMPARISON OF ACTIVITY BY DISTRICT

- By Product Type
- By Volumes (Commercial & Free Permits)
- By No. of Permits (Commercial & Free Permits)
- Commercial Logging Over 500 m3
- Operating Sawmills
- Secondary Manufacturing

4.01 Commentary:

The next series of slides will depict the level of activity by product, volumes, and numbers of permits by district.

Permits are broken down into two types:

1. Free permits - Yukon residents may apply for a free firewood permit up to a maximum of 25 cords a year. There are about 2.5 m^3 per stacked cord (3.72 m^3 per cord without airspaces). Forestry uses a conversion of 90 m^3 per cord.

2. Commercial Timber Permits (CTP's) - these permits are available to Canadian citizens over the age of 19 years up to a maximum of 15,000 m^3 per year for a nominal stumpage fee. There are several planning, environmental and operational requirements that must be undertaken in association with the issuing of commercial permits.

At one time, Yukon timber was regarded as a resource for Yukoners. However, with changes recently taking place in North America and the world regarding free trade and the

removal of trade barriers, it seems Yukon timber is available for anyone. This is one of the concerns of local industry.
Yukon forests are at the mercy of world market forces, and it seems we can no more keep wood fiber here than we could keep gold here 100 years ago.

SLIDE

4.1 TIMBER PRODUCTION BY PRODUCT TYPE

4.11 Commentary:

The chart shows a comparison by volume of the types of products produced within the Yukon as a whole during 1994-95. Last year, the pine log component was only one quarter of what it is this year.

What was considered marginal and unmerchantable as little as 3 years ago, is now being harvested due to the higher value placed on wood fiber in the market place.

Additional miscellaneous slides depict data by district as follows:

Fig. 1. Activity by # of permits issued.
Fig. 2. Activity by volume of commercial and free permits.
Fig. 3. Activity by volume of product
Fig. 4. A final slide shows a 13 year overview of harvest levels throughout the Territory.

SLIDE

4.2 TIMBER PRODUCTION BY DISTRICT

■ Beaver Creek

4.21 Commentary:

In the Beaver Creek district, the main product derived from the forest is fuelwood generated from free permits. One sawmill shows no activity during the current year and another small headrig mill is operational on a very limited basis.

SLIDE

4.3 TIMBER PRODUCTION BY DISTRICT

■ Carmacks

4.31 Commentary:

Carmacks district is largely firewood and roundwood. The fuelwood operation includes chipping wood for a boiler system at the Little Salmon-Carmacks First Nation multi-purpose complex. There are about 15 commercial firewood cutters in the area.

SLIDE

4.4 TIMBER PRODUCTION BY DISTRICT

■ Mayo

4.41 Commentary:

Mayo is solely devoted to firewood production with 10 commercial permits taking 60% of the 1800 m^3 volume in 1994-95.

SLIDE

4.5 TIMBER PRODUCTION BY DISTRICT

■ Dawson

4.51 Commentary:

The chief product in the Dawson district is firewood, about 60% being cut commercially. About 15% of the volume is from sawlogs. There is a long-standing sawmill operation in Dawson City.

SLIDE

4.6 TIMBER PRODUCTION BY DISTRICT

■ Teslin

4.61 Commentary:

Two-thirds of the Teslin district production is under commercial permit, mostly in spruce and pine sawlogs. Total volume is less than 2000 m^3.

SLIDE

4.7 TIMBER PRODUCTION BY DISTRICT

■ Ross River

4.71 Commentary:

Ross River production includes 2500 m^3 of sawlogs and a minor component in fuelwood and roundwood of less than 200 m^3.

SLIDE

4.8 TIMBER PRODUCTION BY DISTRICT

■ Haines Junction

4.81 Commentary:

Haines Junction district has one 15,000 m^3 CTP for sawlog harvesting, representing 85% of the area timber production. The balance of activity is in the fuelwood sector.

SLIDE

4.9 TIMBER PRODUCTION BY DISTRICT

■ Whitehorse (Tagish & Laberge)

4.91 Commentary:

Whitehorse (including Carcross/Tagish and Laberge) has over 300 permits of which about 250 are free permits. The commercial permits for firewood take up to 64% of the fuelwood volume.

There are several small sawmill operations including bushmill headrigs, Scragg mills, portable bandmills and Alaskan chainsaw mills. Of the 12 mills, it is not certain how many are currently in operation. Size of the operations generally manufacture logs from small permits of 500 m^3 or less. Some operations may have generated additional inventory from the clearing of the Whitehorse sewage lagoon development. These numbers are not readily available.

The balance of commercial permits include 64% of fuelwood volume.

SLIDE

4.10 TIMBER PRODUCTION BY DISTRICT

■ Watson Lake

4.10.1 Commentary:

The Watson Lake district is almost completely devoted to sawlog production. There has been a significant increase in the utilization of pine for sawlogs as compared to the spruce volumes. This does not include the projected 33,000 of spruce that Kaska Forest Resources proposes to log this winter from the Upper Liard Timber Harvesting Agreement.

About 17% of sawlogs harvested in Watson Lake to date have been harvested for local manufacture. That percentage may drop to less than 10% when current permits have been harvested.

SLIDE

5. SUMMARY OF PERMITS

- Non-commercial (free) permits for firewood
- Commercial Timber Permits
- Transplant permits

5.01 Commentary:

This table shows a summary of permits by type for the Territory. A total of 634 permits have been issued to Dec.31, 1994.

SLIDE

6. OPERATING SAWMILLS

- In 1994, 16 Yukon sawmills produced about 9.6 million board feet of lumber
- This utilized approximately 55,000 m^3
- Another 260,000 m^3 will come from Crown land for log exports to Mar.31/95
- 1/3 of sawmills currently operating

6.01 Commentary:

Fig. 5. An additional slide depicts the location of 18 Yukon sawmills and the 6 that are operating as of Feb.1, 1995.

During the Symposium, we were informed of 6 additional small operations in the Whitehorse district. The initial report dealt with operations whose permits were larger than 500 m3. There may be other similar small operations throughout the Territory which were not included in the report.

SLIDE

7. OVERALL STATUS

- Comparison to Previous Years in Thousand m^3

7.01 Commentary:

Fig.6. Graph.

Over the last 13 years, firewood volumes have declined while sawlog production has increased. Peaks in sawlog production occur in 1988 when Hyland Forest Products put up major inventory at the Watson Lake millsite. (Notice the corresponding dip in firewood permit volumes shortly after as truckloads of deteriorated logs were shipped to Whitehorse for firewood.)

The peak in 1994-95 represents very little inventory at local mill yards as most logs are now exported. Mills are exporting logs to raise capital. This syndrome is partly due to the fact that financing for sawmills is nigh impossible to get given the one year tenure system now in place.

Local mills can also finance their log inventory by shipping some (or all) of their logs (short-term) to raise the necessary capital.

Kaska Forest Resources is the fore-runner in implementing a log export program to finance capitalization of sawmill construction projects. Other mill are now following suit.

SLIDE

8. VALUE OF PRODUCTION

- F.O.B. Yukon - 1994/95 in $million		
- Lumber	@ $375	$ 3.6
- Firewood	@ $115/cord	$ .9
- Logs (WL)	@ $38/ m^3	$ 9.7
- Trucking	@ $42/ m^3	$11.9
- Total Value		**$26.0**

8.01 Commentary:

These values are estimated averages for the year and may in fact be somewhat higher. Lumber prices have been as high as $465 per Mfbm, and firewood as high as $130 per cord. Conversions from cordwood to cubic meters is subjective as there isn't a solid 3.72 m^3 per cord of wood (airspace, bark, etc.) Actual volume is closer to 2.5 m^3 per cord. Forestry uses the 90 m^3 per 25 cords as a conversion in calculating fees due.

Log values in Watson Lake varied from $20 to $42 on a stump to truck basis, while log values to B.C. markets varied from a low of $68/ m^3 to a high of $120/ m^3 for bush run (unsorted) logs.

B.C. mills can offer a higher price for logs due to the fact that pulp chip prices have risen from a typical average of $70-80 per tonne to $140. This waste revenue more than covers the cost of shipping logs by road for distances up to 750 miles. Reduced stumpage rates also make Yukon wood more attractive.

Watson Lake sawmills must compete with more efficient B.C. mills without the benefit of revenue from sawmill waste, as well as on the basis that they only produce rough green lumber products. In the Yukon, waste wood generated in manufacturing lumber is currently an economic liability due to the cost of handling and disposal.

Trucking values include trucking from the landing to the mill, or from landing to the log market destination. Rates vary from $35/ m³ to Fort Nelson up to $64/ m³ to Burns Lake, B.C.

SLIDE

9. LOG PRICE TRENDS

- Price per m³
- Average bush run price 1994-95
- Multiply by 5.66 to get cost per Mfbm to Yukon mill

9.01 Commentary:

The graph compares local log price trends to northern B.C. log prices over the past year. Log prices to local mills have risen to $200 per Mfbm. With costs of $125 to $150 per Mfbm for manufacturing costs, there isn't much left from the sale of the lumber product at an average return of $375.

SLIDE

10. HARVESTING PRACTICES

■ Block size, spacing, cut-leave ratios, leave trees within block, viewscape, wildlife constraints
■ Industry trend toward more manageability and less impact
- Single grip harvesters & processors
- Low ground pressure equipment
- Forwarding vs. skidding
- Select logging

10.01 Commentary:

In engineering a harvest area, average block sizes are less than 15 hectares in size. Buffers are placed along streams and ephemeral draws to protect water courses, as well as on steep slopes where silviculture operations would prove difficult later. Visual buffers are also strategically placed to reduce line of sight visibility to 350 meters within the cutblock.

Foresters generally try to achieve a cut-leave ratio of less than 50%. Non-merchantable trees such as poplar, immature residual ;and dead trees, are left standing in the cutblocks. Dead trees are intended for cavity-nesting bird habitat.

Viewscape management is increasing as a priority in engineering with quite extensive digital terrain modeling being done around communities.

Other constraints that are examined include wildlife travel corridors and foraging areas, sensitive soils, recreation areas, trails, traplines, migratory bird nesting areas, etc.

In order to address some of the concerns and still be able to utilize the forest resource, industry operators are turning to more environmentally friendly systems. These include low ground pressure equipment, directional felling and different methods of log handling to reduce impact on soils and residual stands. Various silvicultural systems, like selective and shelterwood logging are also being explored as alternatives.

SLIDE

11. KEY ISSUES FOR YUKON FOREST INDUSTRY

■ Tenure longer than one year
■ Cost of power
■ Cost of transportation
■ Revenue for wood waste
- lack of market
■ Access roads to resources
- shared cost for users
■ Woodsman's Lien Act for greater financial stability
■ Utilization and sustainability

11.01 Commentary:

The issues described here relate to the stability of the industry in the future. With increasing demand for wood fiber globally, the Yukon will merely become the cupboard for the world unless steps are taken to ensure an industry can develop beyond what it is today.

Stumpage is not included here as an issue at this point, as it can also be a tool to encourage local manufacture of logs into quality lumber products. Industry agrees that stumpage rates need to be increased to provide for silviculture and forest management. Any attempt to compare stumpage rates with B.C. and call for similar rates for Yukon is completely unrealistic. Rates in B.C. reflect the government's cost in planning, engineering, mapping, road construction, timber cruising, silviculture and fire-fighting costs. A lot of these developmental costs are now borne by individual forest operators and timber permit holders.

To get to the stage where Yukon lumber manufacturers can hope to compete, an infrastructure system needs to be developed that will address these issues.

The wood fiber base itself can be used to reduce the cost of power, reduce the cost of transportation on rough green lumber products, reduce the risks of capital financing and general business practice, provide additional revenues from alternative products, and, in the end, make the industry more viable and self-sufficient.

For this to occur, there must be cooperation and support from all levels of government, as well as amongst forest industry operators.

SLIDE

12. SUSTAINABILITY

■ Develop revenue market for waste
■ Improve utilization
■ Improve manufacturing recovery
■ Focus on value and quality
■ Impact on AAC
■ The forest resource is only as sustainable as we make it...

12.01 Commentary:

The forest resource is a renewable resource. Sustainability of harvesting activities depend on a number of factors which, if addressed now, could be ensured barring uncontrollable natural disasters and catastrophic events.

Improved utilization will generate more revenue for the same volume of wood fiber. Revenue from waste wood markets would greatly assist in this area.

Fig.7. Miscellaneous slide shows relationship between lumber recovery factor and waste.

Improving product recovery from raw logs and extracting quality and higher value will offset the need for a greater quantity of raw material inventory. Improved sawing technology in Yukon sawmills can result in a significant incremental saving on wood fiber now wasted as sawdust. Some Yukon operators have tried to develop saleable by-products from their wood waste, including firewood from slabs and edgings, densified wood briquettes, etc.

Fig.8. Miscellaneous slide showing incremental profits available by lumber recovery factor (LRF) and sale price per thousand board feet.

The AAC (annual allowable cut) has been determined with a number of assumptions factored into the equation to arrive at a sustainable harvest level. (Draw diagram during explanation) From the total area within a district there is a determination of the area of productive forest land within certain limits of operability eg. 150 miles radius from major center of Watson Lake. The area is reduced again by percentages to allow for future deductions such as parks, riparian buffer zones, wildlife considerations, fire loss, etc. Productive forest land is further reduced to include only those stands with a volume of 150 m^3 per hectare or more. To this gross volume is added the mean annual increment per hectare. That is then divided by 115 (100 year rotation and 15 year regeneration lag) This simple explanation belies the complicated compilations and calculations that actually determine the AAC for a given area.

With the current high price being paid for wood fiber, timber permit holders are harvesting in stands below 150 m^3 per hectare. This is bonus wood. Basically, these stands were not used in the AAC calculations and the volume harvested can be added to the calculated AAC. This has the net effect of extending wood reserves into future years.

SLIDE

13. NEXT STEPS

■ Past actions taken
- Efficiency in harvesting improving

■ Future actions
- Quality and recovery in lumber manufacture
- More intensive forest management and planning

13.01 Commentary:

The industry has seen some improvements in harvesting. Until recently, we haven't had feller-bunchers and single-grip harvesters processing trees. No seemed to know what a stroker-delimber, a log forwarder or a butt 'n' top loader was. The logging industry has become very efficient in handling and processing trees into logs.

What we need now is for Yukon sawmills that have been built on 40-year old technology to improve on its lumber manufacturing capability to extract the most value out of the raw log and utilize the waste as much as possible.

There is also a need for better planning and implementation of the overall harvesting scheme. Communities that are developing a forest-based economy do not want to be sitting in the middle of a hole in the forest created by concentric-circle logging while looking miles away to a resource base that cost too much to economically utilize. Although recent experience proves that 750 miles can't be too far, one never knows when the world economy and wood fiber prices take a drastic downturn.

Planning should incorporate community values and attempt to integrate and consider other resource users, given that some uses are mutually exclusive. There are many and varied opportunities for realizing greater value and economic benefit from the forest resource.

Fig.1

Distribution of Activity by Number of Permits
to December 31, 1994

DISTRICT	RR	BC	MA	TE	DA	CA	XY	HJ	WL	TOTALS
Commercial	2	0	10	9	21	16	61	20	39	178
Free Permits	3	16	26	22	41	25	247	42	34	456
TOTALS	5	16	36	31	62	41	308	62	73	634
% of Totals	1%	3%	6%	5%	10%	6%	49%	10%	12%	100%

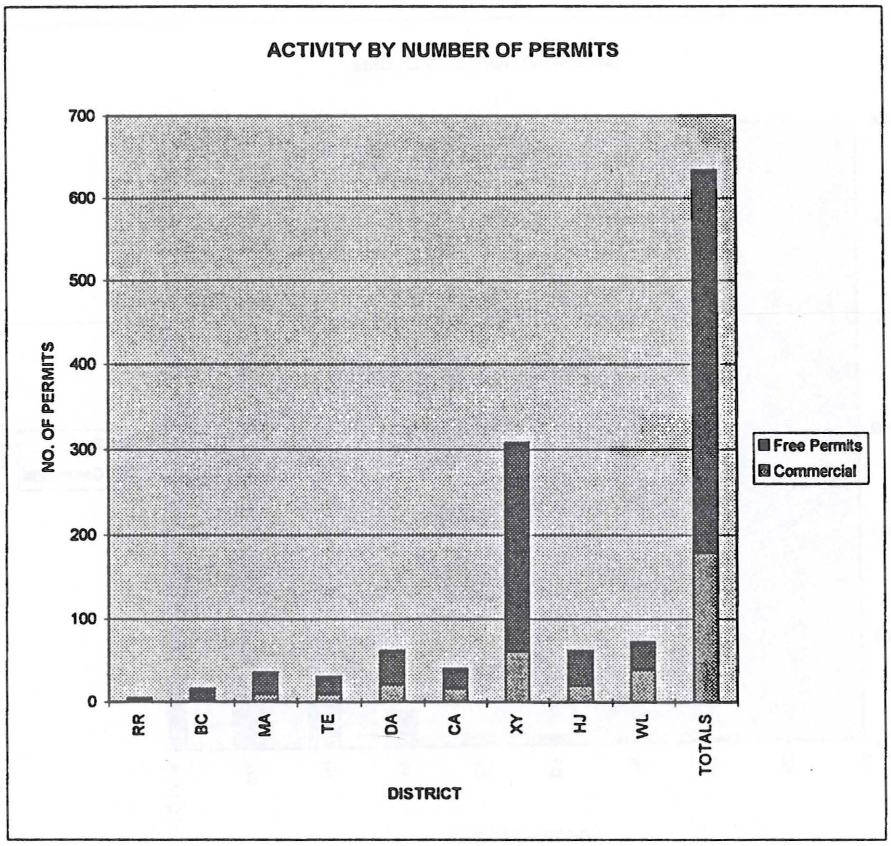

Fig.2

Distribution of Activity By Volume (m3) and by Commercial vs. Free Timber Permits

DISTRICT	RR	BC	MA	TE	DA	CA	XY	HJ	WL	TOTALS
Commercial	50	0	1032	1359	2876	4890	11877	20187	230494	272715
Free	67	583	731	498	1647	572	6594	1333	1445	13403
TOTALS	117	583	1763	1857	4523	5462	18471	21520	231939	286118
% of Totals	0%	0%	1%	1%	2%	2%	6%	8%	81%	100%

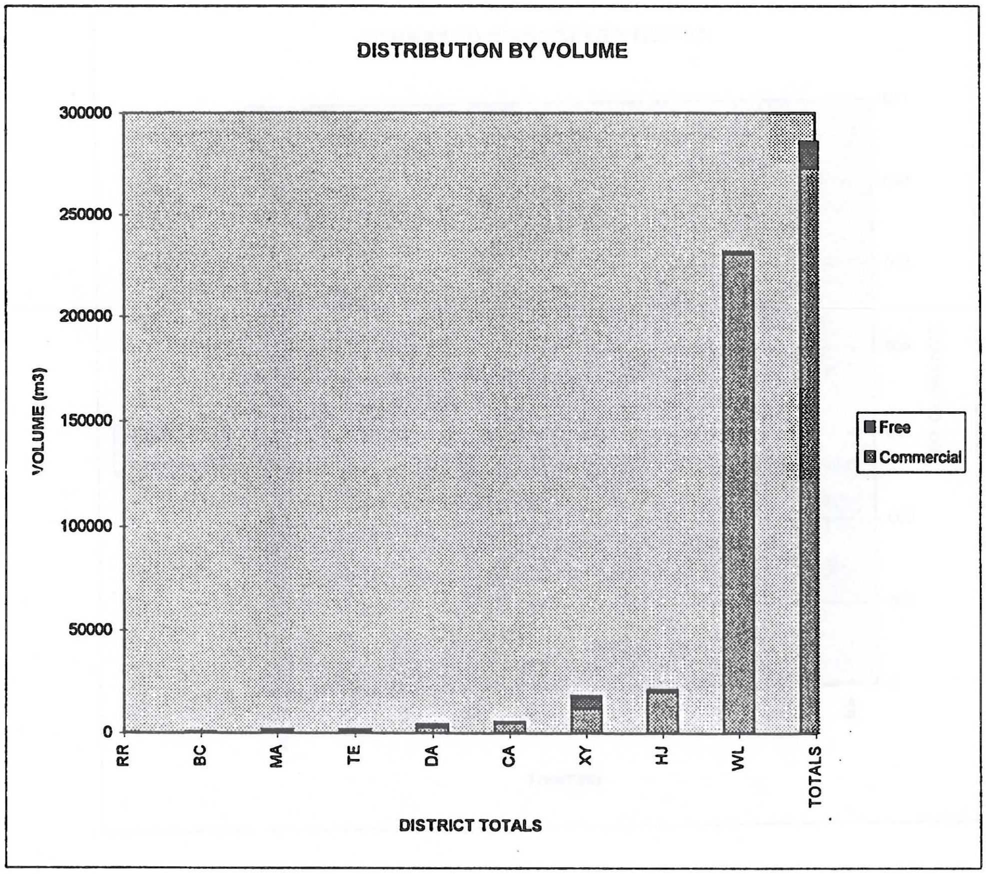

Fig.3

Timber Production to December, 1994

Volume m3

	No.of permits	Fuelwood	Roundwood	Sawlogs Spruce	Pine	Total Vol.
1 Beaver Creek	16	785	11			796
2 Carmacks	41	2764	275	2500		5539
3 Mayo	36	1032				1032
4 Dawson	62	3846		677		4523
5 Teslin	31	863	50	500	444	1857
6 Ross River	5	96	21			117
7 Haines Jct.	62	2084	264	15400		17748
8 Whse/Laberge	308	13610	1266	5486	2205	22567
9 Watson Lake	73	1445	180	136162	94152	231939
Totals	634	26525	2067	160725	96801	286118

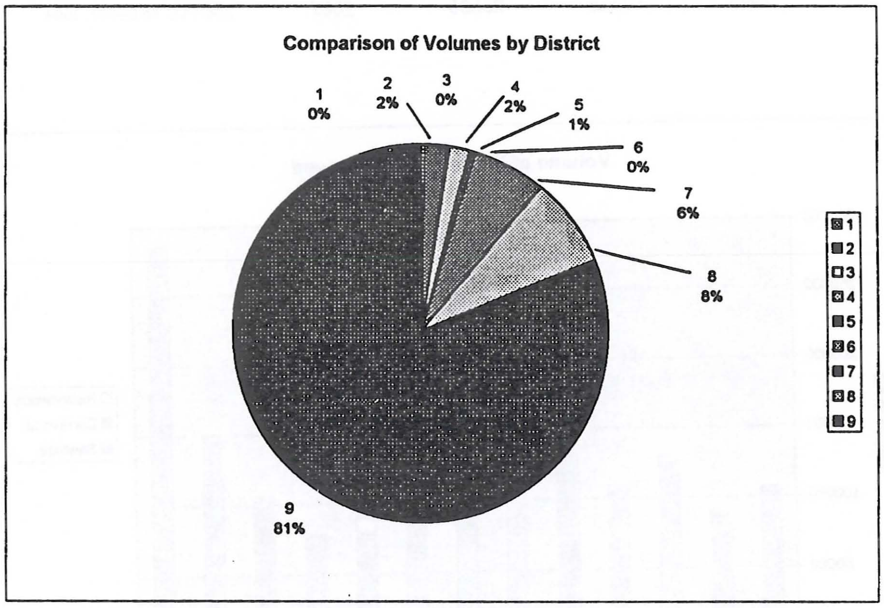

Fig.4

Volume of Permits Issued by Year

Year	Sawlogs	Cordwood	Roundwood	Total
1983	13806	89299	3136	106241
1984	13366	74143	2500	90009
1985	64188	61012	4585	129785
1986	30668	73591	4053	108312
1987	38754	98086	4011	140851
1988	169251	67076	7479	243806
1989	79954	50720	2637	133311
1990	59503	92983	3223	155709
1991	39070	40266	10598	89934
1992	38479	38257	1901	78637
1993	65862	36952	2648	105462
1994	110940	36498	2823	150261
1995	257526	26525	2067	286118 To Dec.31, 1994

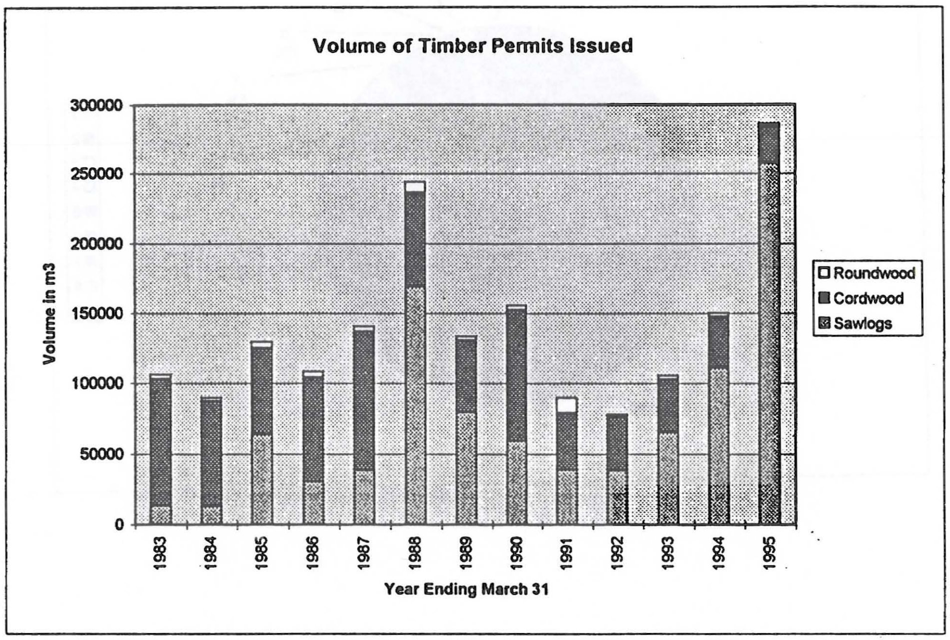

Fig.5

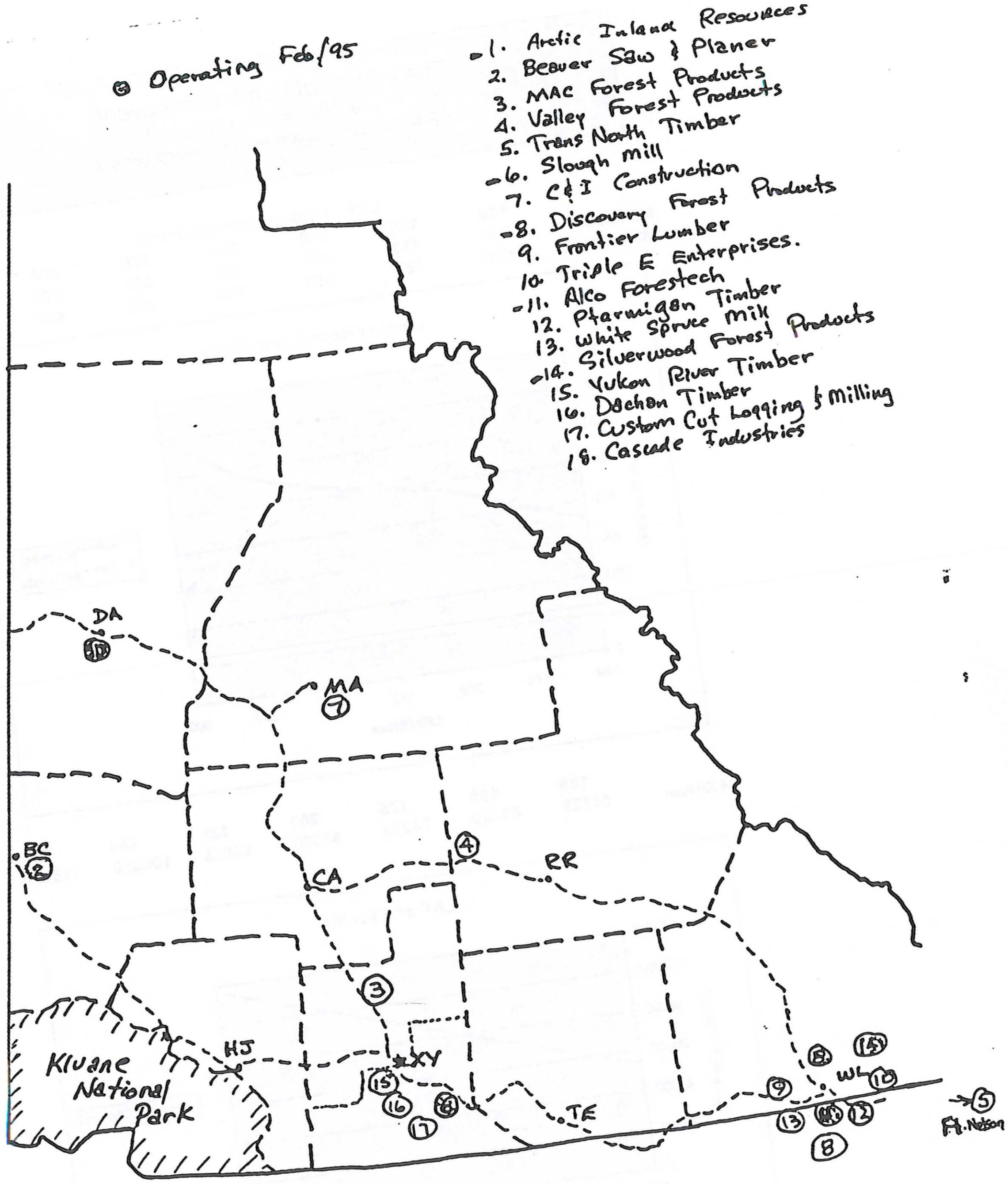
⊙ Operating Feb/95
1. Arctic Inland Resources
2. Beaver Saw & Planer
3. MAC Forest Products
4. Valley Forest Products
5. Trans North Timber
6. Slough mill
7. C&I Construction
8. Discovery Forest Products
9. Frontier Lumber
10. Triple E Enterprises.
11. Alco Forestech
12. Ptarmigan Timber
13. White Spruce Mill
14. Silverwood Forest Products
15. Yukon River Timber
16. Dechen Timber
17. Custom Cut Logging & Milling
18. Cascade Industries
DA
MA
BC
CA
RR
HJ
XY
TE
WL
Kluane National Park
Ft. Nelson

Fig.6

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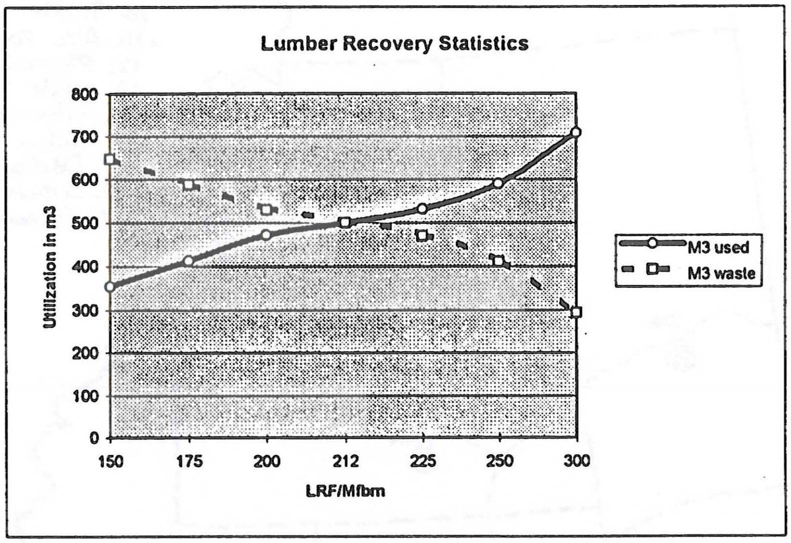
The Impact of Lumber Recovery

(per 1000 m3 of raw logs)

LRF = amount of board feet recovered per m3

LRF - Lumber Recovery Factor

	150	175	200	212	225	250	300
M3 used	354	413	472	500	531	590	708
M3 waste	646	587	528	500	469	410	292



	125	150	175	200	225	250	275
$425/Mfbm	53125	63750	74375	85000	95625	106250	116875

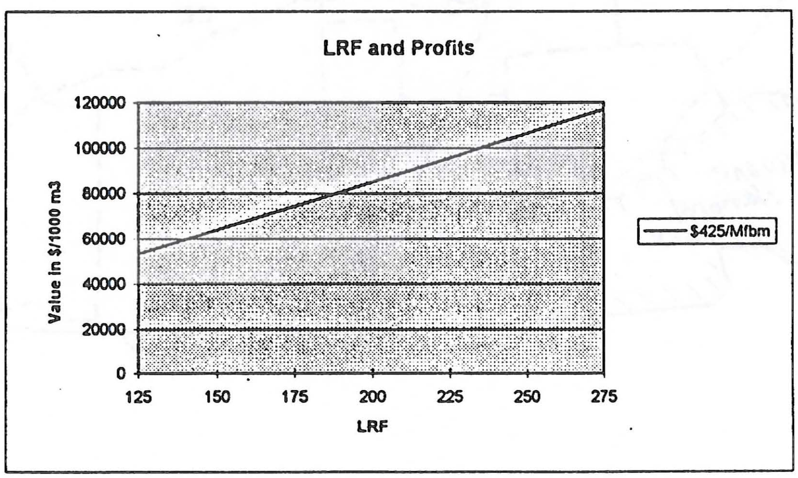


Fig.7

Fig.8

Profits in Lumber Recovery

Price per Mfbm

LRF Diff.	$350	$375	$400	$405	$425	$450
1	350	375	400	405	425	450
2	700	750	800	810	850	900
3	1050	1125	1200	1215	1275	1350
4	1400	1500	1600	1620	1700	1800
5	1750	1875	2000	2025	2125	2250
6	2100	2250	2400	2430	2550	2700
7	2450	2625	2800	2835	2975	3150
8	2800	3000	3200	3240	3400	3600
9	3150	3375	3600	3645	3825	4050
10	3500	3750	4000	4050	4250	4500
11	3850	4125	4400	4455	4675	4950
12	4200	4500	4800	4860	5100	5400
13	4550	4875	5200	5265	5525	5850
14	4900	5250	5600	5670	5950	6300
15	5250	5625	6000	6075	6375	6750
16	5600	6000	6400	6480	6800	7200
17	5950	6375	6800	6885	7225	7650
18	6300	6750	7200	7290	7650	8100
19	6650	7125	7600	7695	8075	8550
20	7000	7500	8000	8100	8500	9000
21	7350	7875	8400	8505	8925	9450
22	7700	8250	8800	8910	9350	9900
23	8050	8625	9200	9315	9775	10350
24	8400	9000	9600	9720	10200	10800
25	8750	9375	10000	10125	10625	11250
26	9100	9750	10400	10530	11050	11700
27	9450	10125	10800	10935	11475	12150
28	9800	10500	11200	11340	11900	12600
29	10150	10875	11600	11745	12325	13050
30	10500	11250	12000	12150	12750	13500
31	10850	11625	12400	12555	13175	13950
32	11200	12000	12800	12960	13600	14400
33	11550	12375	13200	13365	14025	14850
34	11900	12750	13600	13770	14450	15300
35	12250	13125	14000	14175	14875	15750
36	12600	13500	14400	14580	15300	16200
37	12950	13875	14800	14985	15725	16650
38	13300	14250	15200	15390	16150	17100
39	13650	14625	15600	15795	16575	17550
40	14000	15000	16000	16200	17000	18000

Table shows increase in profits per 1000 m3 for each increment of board foot recovery at specific lumber prices F.O.B. mill.

Example: For a lumber price of $425 and an increase in recovery of 20 fbm/m3, on a log volume of 5 thousand cubic meters, the increased profit would be 8500 times 5, or $42,500.

QUESTION PERIOD

Topic: **Yukon Forest Industry**
Speaker: **Harry Holmquist**

Q: Just a comment about the allowable cut. You have taken your inventory, and you have taken your merchantable timber, and you have netted it down to the remaining amount of area, and you have divided it by 100. That's area-based regulation. My understanding of that, for area-based regulation to work, there are two vital assumptions: one is that the area must regenerate; that you must not lose the growing stock, and that you must balance the age classes 100 years. I will bet you that you are violating those assumptions.

A: It is area based on 150 metres per hectare, and it was based on volume. The study was done by a group in B.C. -- Stirling Wood Group -- and they spent three years, but there was a lot of input by, I think, almost all the resource users. The study was initiated by the Liard First Nation, and it was a long process. It hasn't gone to public review yet, but there has been a lot of netting down to come up with that figure. And we feel it is conservative. With the fact that we are now logging in marginal stands, we think it is even better. We are not suggesting that the AC (Inaudible) be increased, but we are saying that there are some bonuses now, with the price of logs the way they are.

Q: Coming from British Columbia, I was quite interested -- I came up the Alaska Highway and your comments about how much wood is heading south, are very, very real. I found out also -- talking with a trucker at Trapper Ray's cabin at the Liard Hot Springs -- that a good portion of that is going down to where I am from, and that's in the Cariboo -- just north of Quesnel -- at Strathnaver.

My question refers to some of the different harvesting practices that are occurring up here in the Yukon. I am wondering whether or not, with what you said concerning the fact that non-merchantable trees are being left and deciduous, and what not, being left -- it's still a form of hybriding, basically, in terms of an industrial approach to forestry management. I was wondering whether or not there has been any solid work being done into the new forms of ecological forest management that are coming out -- natural selection forestry management, a whole variety of techniques that way, that are much more based on ecological criteria. I was wondering if that kind of planning had moved forward. With your description, it didn't sound like it.

A: I could, I guess, say that we are on the threshold. I think you'll call it ecologically sanctioned hybriding.

Q: The one technique that I was particularly interested in is whether or not natural selection forestry management has been looked at.

A: No, it hasn't -- to my knowledge. I don't know. We are trying different things. Someone is trying to work right now -- it's probably the first time it has been done here -- with single-grip harvesters and forwarders and doing selective cutting, and that is right now in the process of being reviewed as to what kind of stand should be left behind -- stumps per hectare or size by diameter class. That is being looked at.

Q: Unfortunately, the silvicultural system might be defined by the harvesting machine. I am much more interested in looking at the silvicultural system first, and then looking at systems that are able to connect with that. For instance, I am involved with a group of forest loggers down in the Cariboo area that have been active for 15 years. We promote the silvicultural system first, as close to natural selection forestry management as possible, and then look at the different harvesting techniques that can achieve that.

A: Small machines and --

Q: Combination systems and the horse log.

A: Various combinations of those have been looked at. Basically, it boils down to economics. Being this far north, the economics are different than they are down south. There is a lot more costs added to the operator here and it comes down to the bottom line -- can I put food on my table at the end of the day? So, there are some trade-offs, yes. But I think the industry is trying to address some of those concerns and, as demonstrated by the types of machinery that they are coming up with that can do different things that they couldn't do before. Before it was just, kind of, smash it all down, pick up what we can get, and leave the rest or burn it. Now, they are developing machinery that can be more articulate in harvesting the stand and in treating the site. So, I think we are moving that way. I think we have a certain goal in mind. But what you are talking about is very small scale, and I would encourage that. I don't know if that can be done on a large-scale basis, unless we have an awful lot of horses.

Q: We are not talking large-scale. (Inaudible, due to speaker not being at microphone.)

A: That's right. The population base is there, and we don't have the population base.

Q: I guess, for other people who are not mathematicians, and things like that, I would like you to explain the number of cords of wood in 300 cubic metres. Looking at 10 years, how many cords per year? Like, we are going to be taking 300 cubic metres of wood a year, you said. Can you tell me how many cords of wood is in that?

A: 300,000 cords. 300,000 cubic metres translates to about 100,000 cords. If the wood was compressed, there's 3.72 cubic metres per cord but, because of the air space, you've got to, kind of, figure out somewhere between 3 and 3.72. I don't know what you use -- 3.2, 3.3., or 3. If you use 3, for quick calculation, that's 100,000 cords of wood.

Q: When you do your press release, I wish you would release that information to the rest of the public here, because I think people are looking at these kind of things, but they don't get a handle on the cubic metres. So, when the individuals in the communities are listening to this press release, and this video, and everything, then they'll know that 300 cubic metres equals 100,000 cords of wood.

A: The number on the screen was 300 x 1,000. They were in thousands of units.

Q: You said that 300 cubic metres a year is going to be taken out.

A: This year, 300,000 cubic metres will be the total for the Yukon.

Q: Yeah.

A: 300,000.

Q: Per year.

A: This year. I can't tell you what is going to happen next year.

Q: No, but I'm saying that, just so we understand that, you are talking about 100,000 cords of wood.

A: Yes, which is what was being logged in the Gold Rush days. We're not that far off, are we? 100,000 cords was being logged up the Yukon River in the Gold Rush, so we're, kind of, back to square one. It's just a different part of the territory.

Q: I'd like to know how much of the timber permit are harvest operators in Watson Lake are doing reforestation and silviculture within the Watson Lake area, besides KFR. You mentioned one thing, though, that KFR did not do this. We do silviculture, we do stuff like this. Besides, when we export timber, we export for a reason -- to generate revenue, to build a mill. This conference itself -- KFR is the biggest logging industry here in the Yukon, and it's pretty sad to see us left out of this conference, because I would like to defend myself, as an industry.

A: Under the agreement that Kaska has with the federal government for the THA, they are required to do silviculture and, in fact, have set aside a silvicultural fund and a mill fund. Part of the revenues from the logging operations, a percentage goes into the mill fund and silviculture fund. The other operators, outside the THA, are not required to do silviculture. That, right now, is the responsibility of the federal government, under the present legislation. There are some operators who have offered to do silviculture, or they will put up monies to do silviculture, in the areas where they are operating. Silviculture costs are approximately $8.00 per cubic metre, on the average. So, there are some companies that are willing to put up that money in order to operate. That has been their prerogative, or their initiative, that they have taken. But CTT operators are not required to -- and it's only a one-year term. So, it's very hard to -- after the one year is up -- make somebody obligated. But KFR, on the other hand, has a longer tenure and has more room for planning and developing seed collection and soil request orders, and so forth. So, they have got more of a planning framework to work under. That is why I am saying that we need to have more attention put on the forest planning to do some of this. But it's happening ad hoc right now, except on the THA. Certainly, what's happened on the THA, there's been a lot of scarifying, planting and training programs for thinning, spacing and brushing.

Q: I would like to ask whether there was an environmental review being done in the Watson Lake area. The reason I ask this is that we're looking in our area, around Haines Junction, where there's some of that beetle infestation -- the trees that have been killed by the beetles. Before anybody can do anything with those trees, there has to be an environmental study done. Is that straight across the board for all of the Yukon, or is that just because there hasn't been any great, excessive logging done in our area that there has to be an environmental assessment done before any of the wood that is there is used?

A: Every commercial timber permit operator has to submit a timber operating plan. The timber operating plan goes for environmental review. I think it is sent out to about 20 different agencies -- Renewable Resources, First Nations, trappers. Anybody that is a resource user in that area can make a comment. What is happening right now, with the passage of CEAA legislation, I think anybody in Canada can comment on your timber operating plan and make some request about environmental concerns. Every plan today has to go through environmental review. If there are some concerns, those concerns need to be mitigated before the permit is approved. It is part of the conditions in the permit for operating that you must do this, or you must not do that, and that's part of the conditions on the issuance of the permit. The resource management officers monitor the activity, and you have to abide by the screening report. So, yes, environmental review takes place on every permit. Some are delayed a lengthy period, waiting for the review to be processed.

Q: In the Haines Junction area, the environmental review has to be done before any logging plan is even presented to the environmental review board. It's being done by the federal government, I guess, before any logging plan is presented to them.

A: Well, they have to have some kind of a plan to understand what the impasse is going to be. So, no, they would have to have the plan to work from. You don't go out and do an environmental review on something that is not going to happen. So, because somebody is planning on doing something there, they're going to review what the environmental impacts are. So, if there is a logging plan in Haines Junction, it will have gone through the environmental review process before the permit is issued to cut. When the plan is sent out to 20 agencies, each of those agencies has a certain timeframe, within which to make a comment or a recommendation, or ask for a further study, based on some kind of criteria, some reason -- "We are concerned about this because ..." If they can give a reason why they are concerned, it can be addressed.

Q: Harry, he's referring to a level two versus a level one.

A: I understand that. Now there is no level one left. It's all under the one agency.

Q: I would just like to comment on that last question. I'm Ed Packee, from the State of Alaska. I'm certainly not here to tell you to set your policy this way or that. But, I would like to tell you about the beetle in Alaska -- 500,000 hectares in the last 10 years. The value of the timber, stumpage-wise, has gone from $125-150 per 1,000 board feet, down to $10-15. The beetle controls the resource, and the bureaucracy controls the harvest. I think that should be a good warning.