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Forest Inventory, Access, and Wood Demand

A Pilot Study in Manitoba

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Petawawa National Forestry Institute

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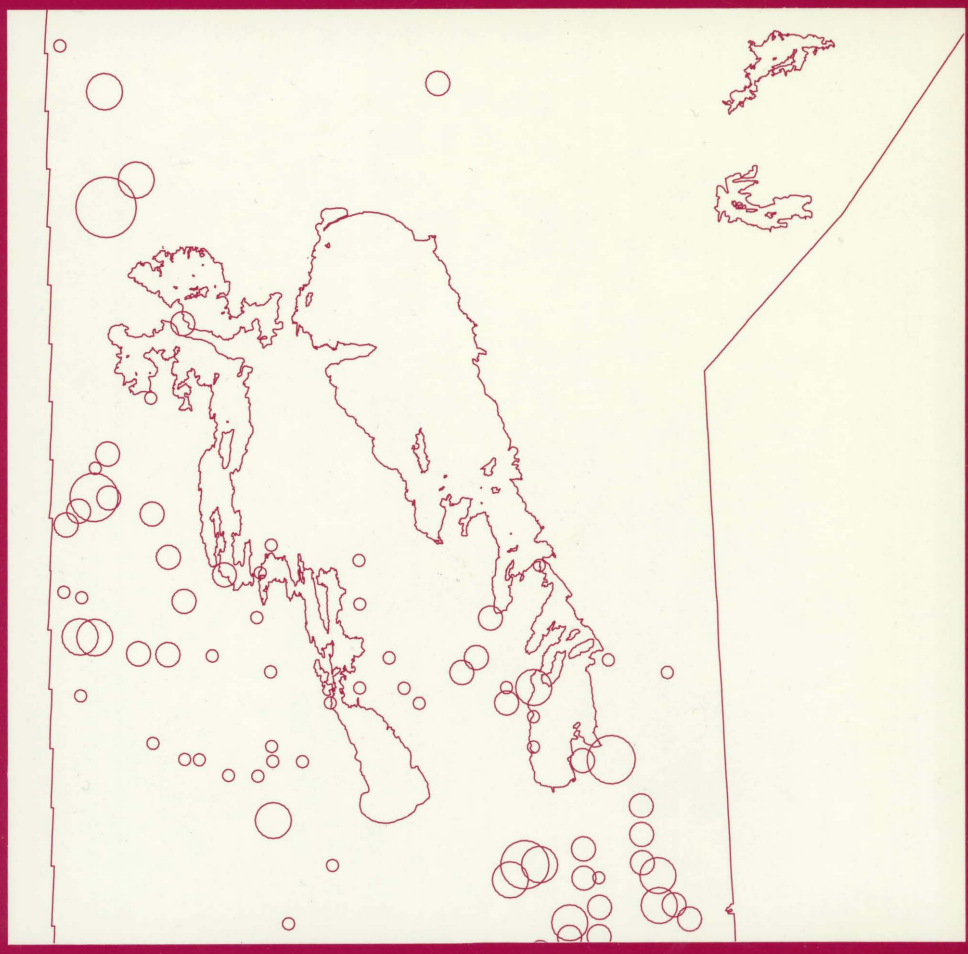

Canada

FOREST INVENTORY, ACCESS, AND WOOD DEMAND

A Pilot Study in Manitoba

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Forestry Statistics & Systems Branch
Petawawa National Forestry Institute
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Chalk River, Ontario
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Forestry Statistics and Systems Branch
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The Forestry Statistics and Systems Branch (FSSB), established in 1980, is responsible for the acquisition, summary and publication of forest resource data on the national level. It is dedicated to improving and expanding the information available on these resources, and to developing efficient methods for that purpose.

Through the Canadian Forest Inventory Committee, the FSSB works in close cooperation with provincial forest agencies, to discuss and make recommendations on forest inventory procedures, and to acquire data for national summaries.

The FSSB has an active Program that includes the acquisition of federal forest resource data, improvement of such data, and standardization within the Federal Government of data collecting methods.

Through the Canadian Forest Resource Data Program, which involves all Regional Research Centres of the Canadian Forestry Service (CFS), the FSSB coordinates data acquisition and analysis within the CFS.

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Abstract

The study was undertaken to show that data on access and on wood demand, obtained by geographic summary units or cells, could be added to the Canadian Forest Resource Data System (CFRDS), and that the integrated, computer-generated summaries would provide new and useful information.

Data on physical access (by road, rail, or water) for each of the 3600 cells in Manitoba were obtained and added to the CFRDS data base. This combination resulted in new tables and maps showing forest areas and volumes of wood, by species, with and without access.

On the demand side, data on the consumption of wood by major mills were obtained. However, because this information was not linked through specific access routes to wood supply areas, no useful tables resulted from this combination. The desirability of using the CFRDS structure to form this linkage was considered doubtful.

Résumé

L'étude entreprise voulait montrer que les données sur l'accès aux forêts et sur la demande de bois, données recueillies à la suite d'un relevé geographique par unité ou canton, pouvaient être combinées à celles du Systèmes de données sur les ressources forestières du Canada (CFRDS) et qu'après l'integration et le traitement par l'ordinateur de toutes ces données on pouvait obtenir des informations nouvelles et utiles.

Les données obtenues sur l'accès à chacun des 3600 cantons du Manitoba, que ce soit par route, par rail, par eau, furent combinées aux données du CFRDS. De cette combinaison ont résulté cartes et tables nouvelles montrant les terres forestières et leur volume de bois, par espèce, que ces terres ayent accès ou non.

Du côté de la demande, des données sur la consommation de bois par les principales usines de conversion de bois furent aussi recueillies. Toutefois, comme ces informations ne spécifiaient pas les routes d'accès aux sources d'approvisionnement en bois, les nouvelles tables n'etaient d'aucune utilité. Quant à savoir s'il n'aurait avantage à passer par le CFRDS pour faire le liaison, ceci n'est apparu bien évidant.

Introduction

The Canadian Forest Resource Data System (CFRDS) is a computer-based system that stores forest inventory information summarized by cells, areas having a target size of 100 km^2. The more than 39 000 cells across Canada are used by the provinces and territories for summary purposes.

The CFRDS shows, for each cell, areas of forest land classified by ownership, status, productivity, age, and other classes. Each record of productive forest land area also shows wood volumes by species groups. This information constitutes a data base on wood supply.

For management and economic analysis, it is useful also to know the extend to which wood supply is physically accessible, and the location and consumption of wood-using industries, i.e. the demand centres.

This pilot study has been undertaken to determine how data on access and wood demand can be obtained for such cells, how they can best be displayed, and how the data can be integrated with existing inventory (supply) information in the CFRDS data base to produce summaries.

The pilot study area is the Province of Manitoba. The 3600 cells in the CFRDS data base are townships, and average 95 km^2 in size.

Access is defined in a strictly physical sense, i.e. whether or not transportation routes exist within a cell. No economic accessibility is implied.

Methodology

Data on access were obtained from 1:500 000 road maps of Manitoba and from staff of the Forest Branch of the Manitoba Department of Natural Resources. Cell boundaries were delineated on the maps, and information for each cell was manually extracted and encoded. The information recorded for each cell was the presence or absence of a transportation route, the type of network (road, rail, or waterway) and, for roads, the quality (paved, gravel, or winter road). Details are in Appendices 1 and 2. The referenced and encoded data were then added to the data base.

Using "A Directory of Primary Wood-using Industries in Manitoba, 1980", the wood processing plants were referenced by cell and classified by type (Appendix 3); also, their wood consumption by species was recorded. These data were then compiled on a per cell basis, referenced and encoded, and added to the data base.

Data summaries were extracted from the data base in the form of tables, maps, and charts. These are presented under results and discussion.

Results and Discussion

1. Access

The manual compilation of access data for each cell was found to be a long and somewhat tedious procedure. However, no significant problems were encountered. Ways of speeding up to the process are being investigated.

Map 1 shows the access of cells within the forested areas of Manitoba, and the type of access: road, rail, or water. It is evident from the map that most areas in Manitoba have some form of access; only the sparsely populated northern portion lacks any form of access, except for the railway line to Churchill.

To produce Map 1, the transportation systems were ranked from high to low (road highest, then rail, and then water), so that where more than one system was present in a cell, the highest ranked system would be mapped.

Tables 1 and 2 exemplify integrated data summaries. Table 1 shows that 33% of the forest land, 37% of the productive forest land, and 45% of the wood volume, have access. As expected the percentages increase, but is is surprising to note the low rate of increase; it appears that less than half the wood volume in Manitoba has access. Table 2 lists the volumes by species. Generally, access to spruce and pine is poorer than to other species.

Many other kinds of tables can be produced that combine access and inventory data, e.g. volumes by road class, or area of forest land by access and ownership. Also, maps that combine access and inventory data can be produced, e.g. of volume per hectare of cells with access.

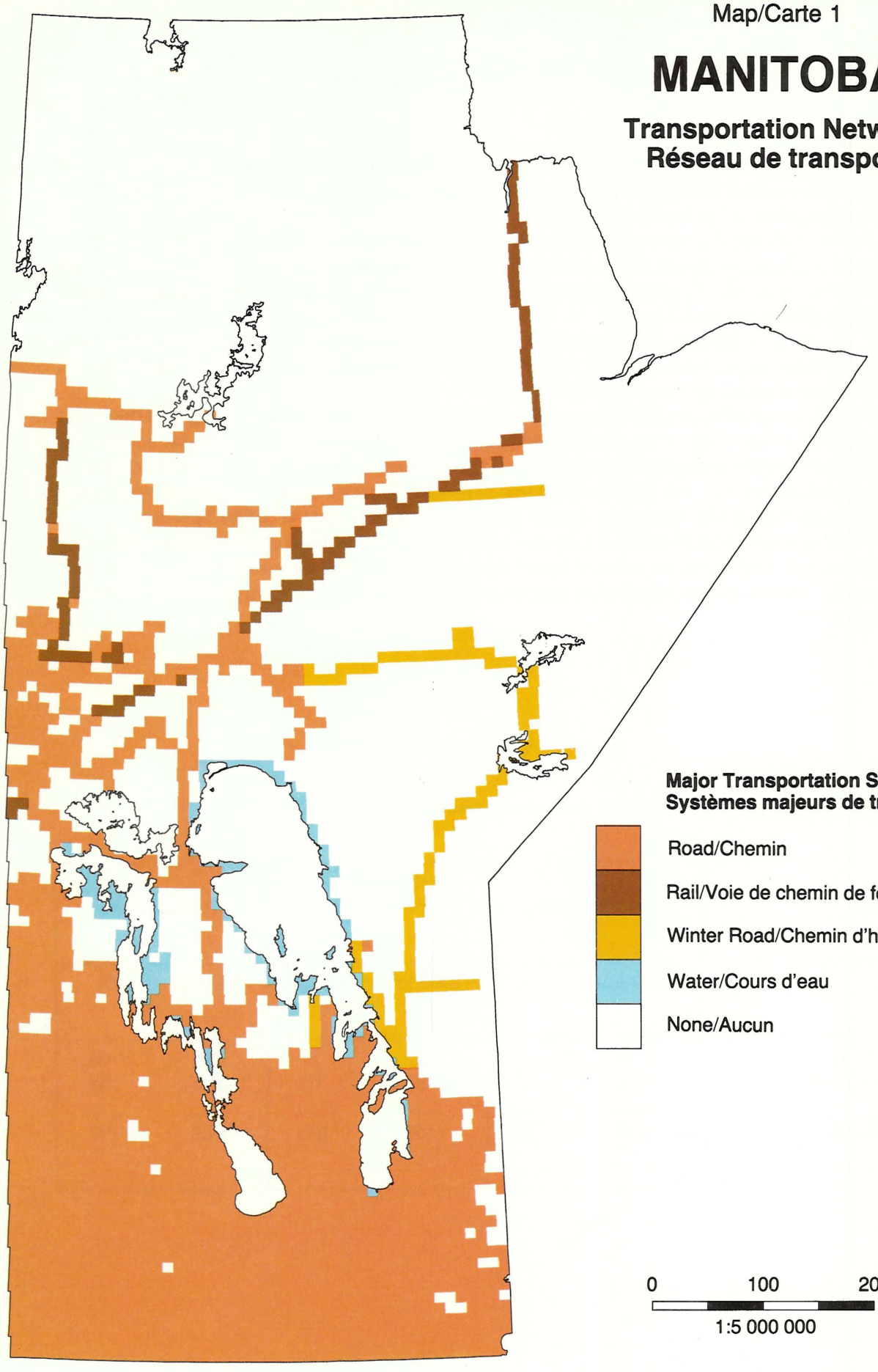
Table 1. Access of forest areas and wood volumes.

Class	Forest Land		Productive Forest Land		Wood Volume	
	(1000 km^2)	%	(1000 km^2)	%	(10^6 m^3)	%
Access	78	33	52	37	288	45
No Access	161	67	88	63	355	55
Total	239	100	140	100	643	100

Map/Carte 1

MANITOBA

Transportation Network
Réseau de transport



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Préparé pour la Direction de la statistique forestière et des systèmes, Service canadien des forêts, par la Sous-division géocartographique, Statistique Canada, 1983.

Table 2. Access of wood volumes.

Class	Species											
	Wood Volume (10^6 m^3)											
	Spruce		Pine		Other Con.		Aspen/ Poplar		Birch		Other Dec.	
	Vol.	%	Vol.	%	Vol.	%	Vol.	%	Vol.	%	Vol.	%
Access	98	38	56	35	13	64	106	61	10	50	5	90
No Access	163	62	106	65	7	36	68	39	10	50	-	10
	261	100	162	100	20	100	174	100	20	100	5	100

2. Wood demand

Compilation of the wood utilization and mill data was simplified considerably by the existence of "A Directory of Primary Wood-Using Industries in Manitoba, 1980" Also, due to the relatively small number of cells with mills, data input was quick and straight forward.

Map 2 shows the location of these wood processing plants, and the wood utilized per years, in m^3. The majority of mills are locted south of Lake Winnipeg, with an arc going up to the western border of the province. Three mills exist in agricultural areas, while the mill with the largest wood consumption is at The Pas, north of Lake Winnipegosis, where more than one million m^3 is used every year.

The mill and wood consumption data are summarized by mill type in Table 3. Of the total annual wood consumption (2.6 million m^3), 58% is used by the two pulp and paper mills, while the 180 saw and planing mills consume 35%.

No integrated data summaries, i.e. combinations of demand and inventory (supply) data, have been produced. The reason is that, with the existing information, it is difficult to establish a meaningful link between supply and demand: it is not known from which cells the wood used in particular mills originate, and transportation corridors between demand and supply cells are not known. It is possible, however, to estimate these relationships and obtain average data. These could be used — with some measure of reliability — for very large-scale (regional or national) summary or projection purposes.

It would also be of considerable interest to produce more detailed integrated summaries of demand, supply, and access. For instance, volume and species of accessible wood surrounding a mill could be accumulated. Other integrated summaries could be produced for economic studies, projections, and analyses but, again, the present data structure is not sufficiently detailed. Provincial forest agencies have the ability to provide, through reduced cell size, this additional detail. There is also a need for such integrated summaries for management purposes and economic analyses. Good use could be made of the structure and approach developed here.

Map/Carte 2

MANITOBA

Wood Consumed by Mills
Bois consommé par usines de conversion

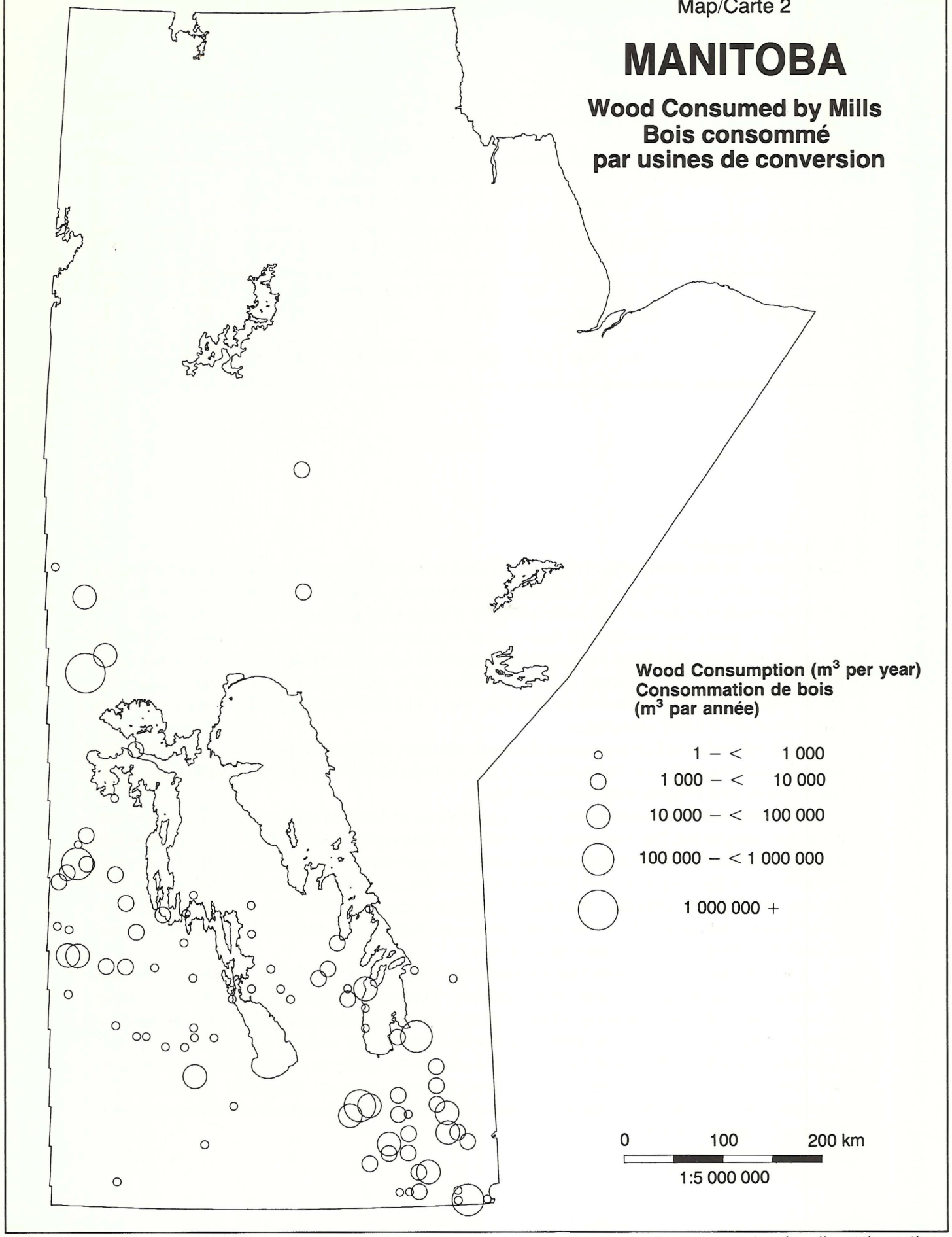

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Table 3. Wood-using industries and wood consumption.

Industry	No. of Plants Number	%	Wood Volume Used* (1000 m^3/yr)	%
Pulp and Paper	2	1	1513	58
Sawmills and Planing	180	88	910	35
Other	24	11	169	7
Total	206	100	2592	100

*For 1979, 1980, or 1981.

Conclusions and Recommendations

Our study has shown that access data can be obtained for the CFRDS summary units or cells, that the data can be integrated with inventory data already in the CFRDS data base, and that combined summaries of access and inventory data, in map and tabular form, can be produced. As additional data bases are created in the CFRDS format, e.g. on biomass or growth, the data they contain can be classified by access using this access data base.

As recommendation to create an access data base for Canada, to classify each of the 40 000 CFRDS cells by access, is being implemented.

As to demand (consumption) and mill data, the study has indicated that the broad CFRDS format can be used to link supply, demand, and access only for very extensive areas. The study also indicates that, if the CFRDS cells can be reduced in size, the system can be used successfully for compilation of detailed data suitable for management and economic analyses. The computer-based system would require the following:

a) cells or summary units much smaller than the 100 km^2 CFRDS target size, perhaps 1 km^2;
b) supply (inventory) and demand (consumption) data for these cells; and
c) a digitized transportation network.

With such a system on the computer, the effectiveness of existing wood allocation can be examined, alternatives can be explored, allowable annual cut data can be related to access, and need for new access routes can be documented.

It is recommended that provincial and other forest agencies responsible for forest management and economic analyses be informed of the feasibility and potential uses of such a system.

Acknowledgements

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Appendix 1

Appendix 1: Coding form used to record access data, with example.

Province		Cell Reference UTM or MTR...								Road	Rail	Water	No. Mills	Mill Type	Wood Required by Mill					Year		Existing Capacity							Year		Major Species 1		Major Species 2	
30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67
0	7		1	W	0	5	6	2	6	0	0	0	0	6	2		2	7	1	7	6	1	8	1	9	9	9	9	9	9	9			0	2	0	1
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0	7		1	E	0	2	5	0	4	4	1	1		0																						
0	7		1	E	0	2	5	0	6	3	1	2		0																						
0	7		1	E	0	2	5	0	7	5	1	2		0																						
0	7		1	W	0	0	6	0	3	4	2	1		0																						

Appendix 2, 3

Appendix 2: Access data — classes and codes.

Transportation System	Attribute	Code
Road	absent	1
	paved	2
	gravel	3
	other	4
	winter road	5
Rail	absent	1
	present	2
Water	absent	1
	present	2

Appendix 3: Demand data — classes and codes.

Mill Type	Code
Pulp and paper	1
Sawmill/planing	2
Veneer and plywood	3
Particle- and fibreboard	4
Pallet	5
Shingle	6
Wood treatment	7
Other	8