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OVERVIEW OF THE COMMODITY DISTRIBUTION SYSTEM BETWEEN WESTERN CANADA AND GATEWAY PORTS

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FOR DISCUSSION PURPOSES ONLY

INTRODUCTION

The purpose of this paper is to provide an overview of the current distribution system which provides for the movement of five key commodities produced in the four western provinces of Canada through five gateway ports to world markets. Given a better understanding of the present system and how it operates, proposals for improving system efficiency or for system redesign can be evaluated more effectively.

Because a physical distribution system is a set of nodal points connected by a transportation network, this overview will be organized accordingly. The origins and destinations of commodities such as grain, coal, forest products, sulphur, and potash will be considered. However, the overview is limited in two respects. First, it will be concerned only with commodity flows originating in the four western Canadian provinces of British Columbia, Alberta, Saskatchewan, and Manitoba. Second, the overview is principally concerned with commodity flows to those five gateway ports which handle the bulk of the tonnage involved in Canadian domestic and international trade.

Finally, major emphasis with respect to the transportation network connecting the points of origin and destination will be on main line and regional railroads, which carry most of the commodity tonnage from the western provinces to the gateway ports. Although the many trucking companies and water carriers which move cargoes to and from port terminals are of considerable importance, they will receive less attention in this discussion.

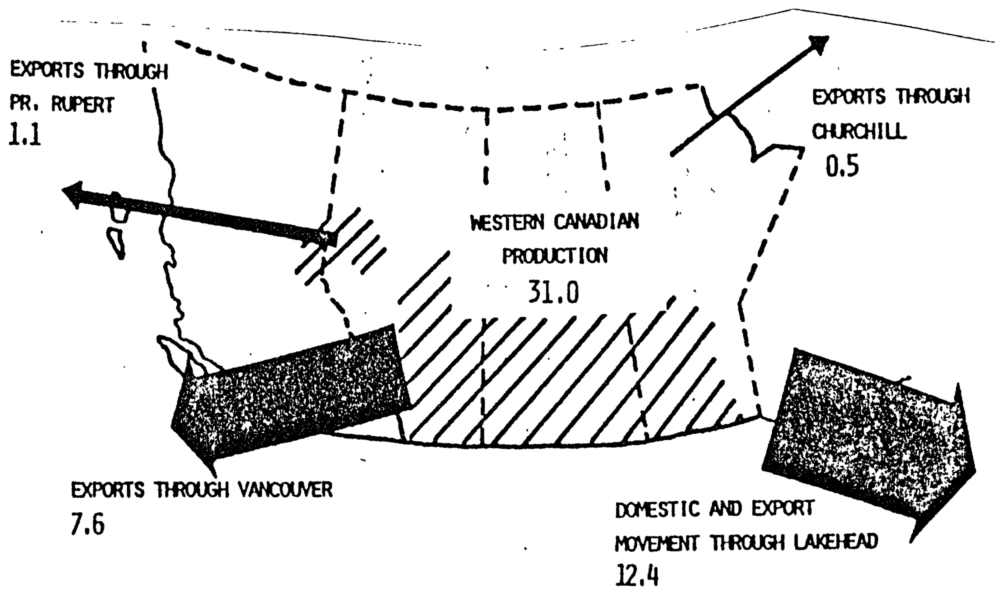
The first part of this overview will discuss the patterns of commodity flows from western Canada to the gateway ports. Next, some descriptive material on the five gateway ports will be presented. Finally, some material on the railway network will be presented.

Patterns of Commodity Flows

Each of the commodities under consideration has a unique pattern of flow from points of origin to the gateway ports. These patterns are influenced by the physical properties of the commodities, the locations of sources and destinations, and the availability and capacities of the transportation modes. A brief overview of these patterns is given below. Much of the material was adapted from Background Paper #4, "Western Ports," published by WESTAC (September 1980).

Grain--Production of grain products in western Canada in 1979 has been estimated at 31 million tonnes.* As seen in Figure 1, Lakehead on Thunder Bay was the gateway port for 12.9 million tonnes, or 40 percent of the total production. As grain is produced mainly in the prairie provinces of Alberta,

Figure 1. Flows of Grain through Western Canadian Ports in International Domestic Trade (In Millions of Tonnes; 1979 unless otherwise indicated).



Source: "Western Ports," WESTAC Background Paper #4, September 1980.

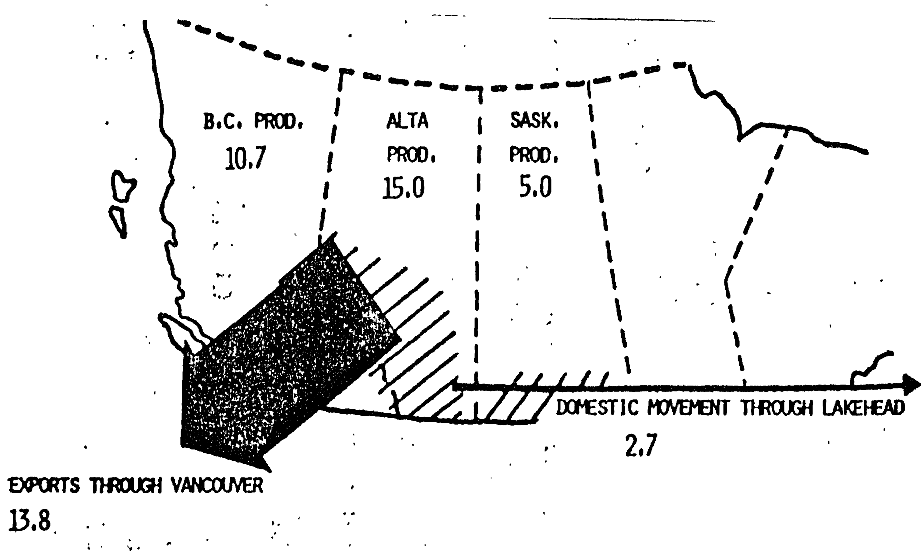
Saskatchewan, and Manitoba, and a great deal of this production is for domestic consumption in the more densely populated areas of eastern Canada, it is not surprising to find that the heaviest flow moves east through Lakehead. The

*In this paper weights are in metric tonnes, equivalent to 2205 pounds. Dollar values are in Canadian currency.

exports through Churchill are generally headed for northern Europe. Exports to the west go mainly through Vancouver (7.6 million tonnes), although Prince Rupert is becoming increasingly important (1.1 million tonnes).

<u>Coal</u>—As seen in Figure 2, this commodity is mined in the three most westernly provinces, with Alberta being the most important source (15 million tonnes), British Columbia second (10.7 million tonnes), and Saskatchewan third (5 million tonnes). The principal flow is westward, with Japan being the largest Pacific rim customer. The port of Vancouver is the dominant export port, while the eastward flow of coal is through Lakehead.

Figure 2. Flows of Coal through Western Canadian Ports in International and Domestic Trade (In Millions of Tonnes; 1979 unless otherwise indicated).

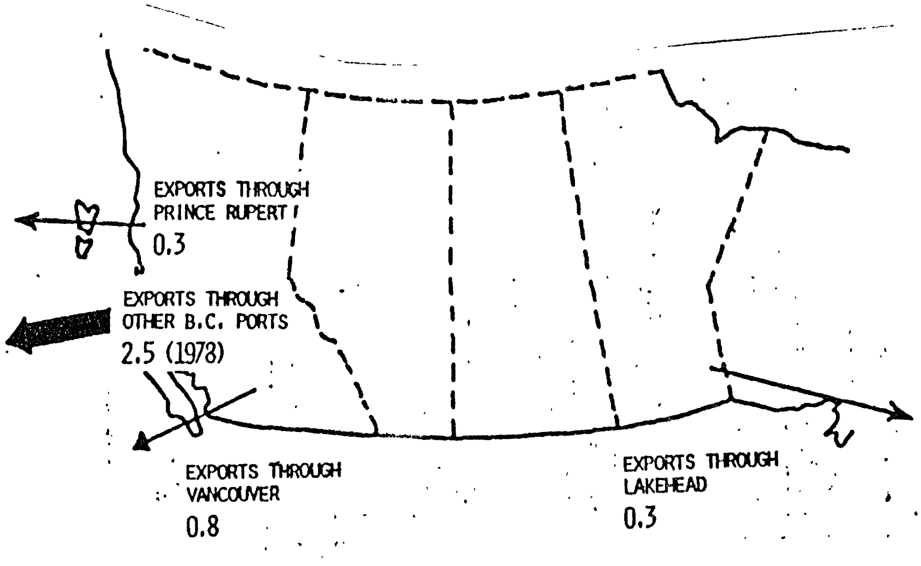


Source: "Western Ports," WESTAC Background Paper #4, September 1980.

<u>Forest products</u>*--Pulp and paper, which accounted for 9 million tonnes of exports in 1979, leave western Canada mainly through local ports, as seen in Figure 3. Patterns of flow through gateway ports indicate that Vancouver,

*Lumber, logs, and other crude forest products are also significant commodities moving through western ports, but current data are not available on these flows.

Figure 3. Flows of Forest Products through Western Canadian Ports in International and Domestic Trade (In Millions of Tonnes; 1979 unless otherwise indicated).

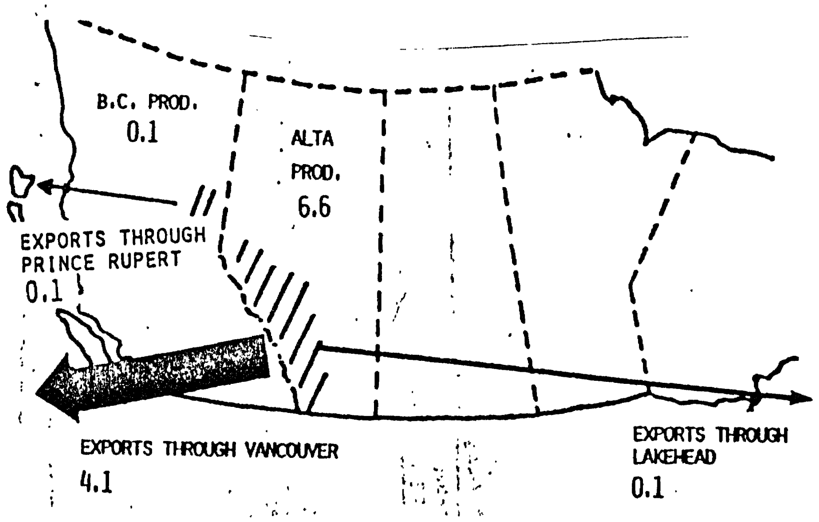


Source: "Western Ports," WESTAC Background Paper #4, September 1980.

Prince Rupert, and Lakehead handle over a third of the measurable exports. Of the three, Vancouver is the most important.

Sulphur--Production of this commodity is concentrated in western Alberta and eastern British Columbia. As seen in Figure 4, the port of Vancouver handles the bulk of the exports (4.1 million tonnes, or 60 percent of total production). Prince Rupert and Lakehead handle smaller shares of the export tonnage.

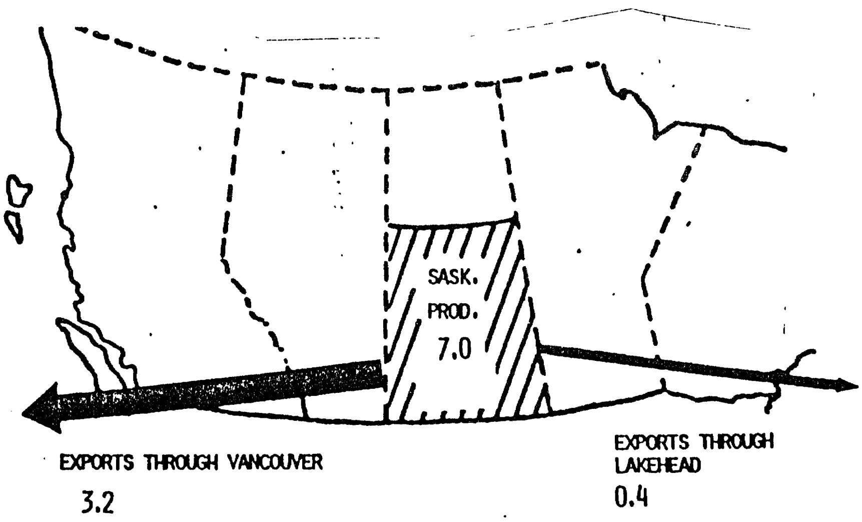
Figure 4. Flows of Sulphur through Western Canadian Ports in International and Domestic Trade (In Millions of Tonnes; 1979 unless otherwise indicated).



Source: "Western Ports," WESTAC Background Paper #4, September 1980.

Potash--This mineral is mined in the southern two-thirds of the province of Saskatchewan. Export patterns are illustrated in Figure 5. Vancouver is the most important port in terms of tonnage shipped, with Lakehead a distant second.

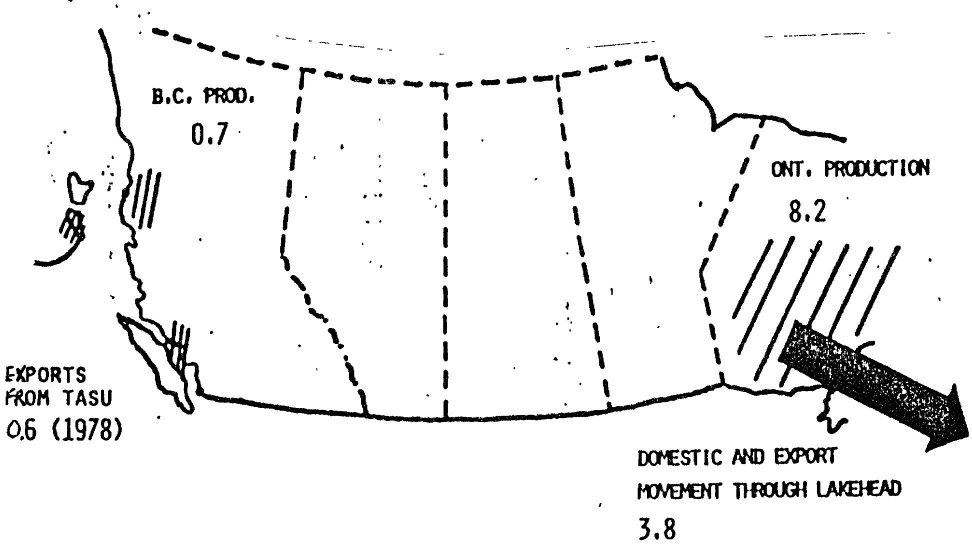
Figure 5. Flows of Potash through Western Canadian Ports in International and Domestic Trade (In Millions of Tonnes; 1979 unless otherwise noted).



Source: "Western Ports," WESTAC Background Paper #4, September 1980.

Iron ore--In addition to the five commodities discussed previously, iron ore is an important export. Because it is produced primarily in Ontario and shipped through Lakehead, it is not a key consideration in any evaluation of west coast gateway ports. There is, however, some production of iron ore in western British Columbia which is shipped out of the local port of Tasu. Iron ore movement is shown in Figure 6.

Figure 6. Flows of Iron Ore through Western Canadian Ports in International and Domestic Trade (In Millions of Tonnes; 1979 unless otherwise noted).



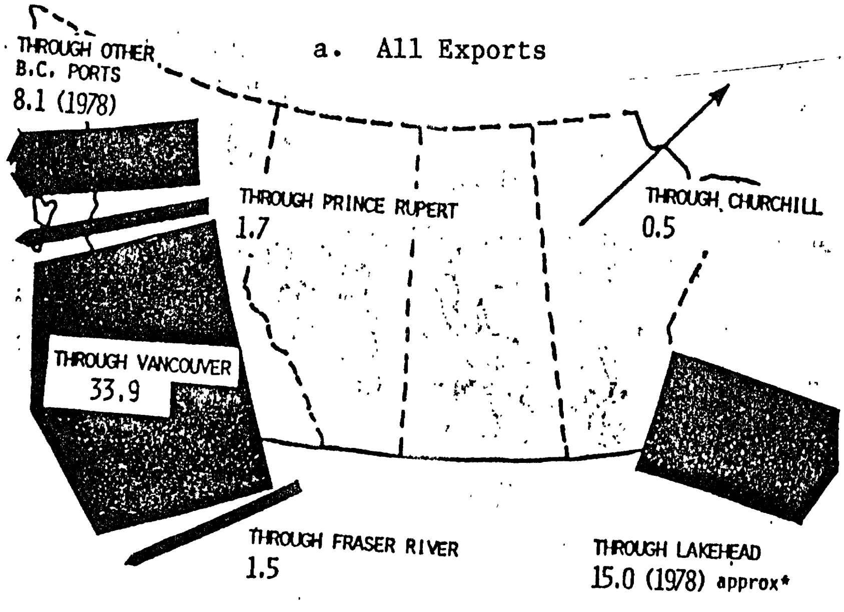
Source: "Western Ports," WESTAC Background Paper #4, September 1980.

Total exports and imports--Figure 7 illustrates total flows both to and from western Canada and shows in a rather dramatic fashion the important role played by the western ports in general, and the port of Vancouver in particular.

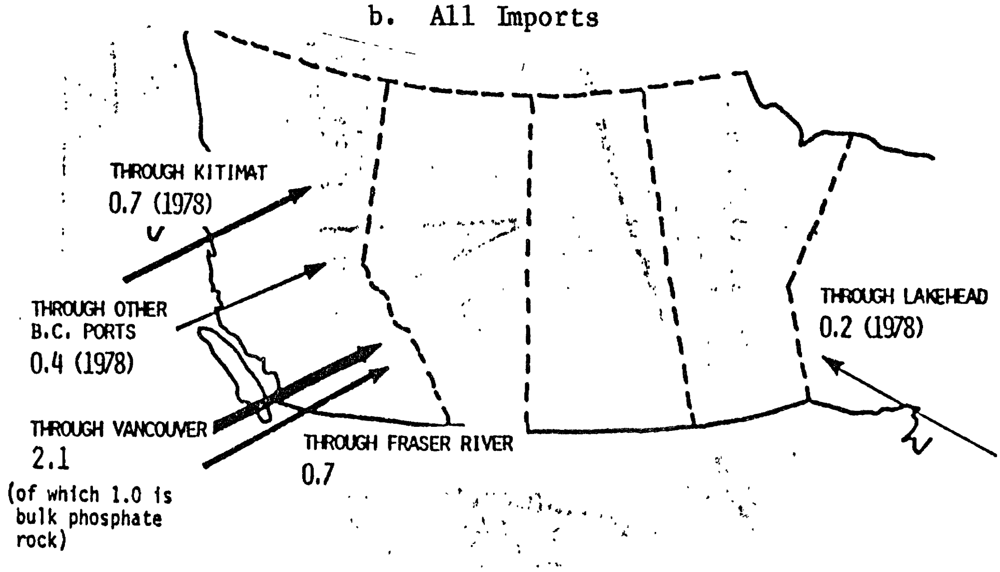
Vancouver is also important in terms of imports, especially the 1-million tonne annual importation of bulk phosphate rock. The Fraser River port is a key entry point for steel and automobiles which originate in Japan.

Figure 7. All Exports and Imports through Western Canadian Ports in International and Domestic Trade (In Millions of Tonnes; 1979 unless otherwise indicated).

a. All Exports



b. All Imports



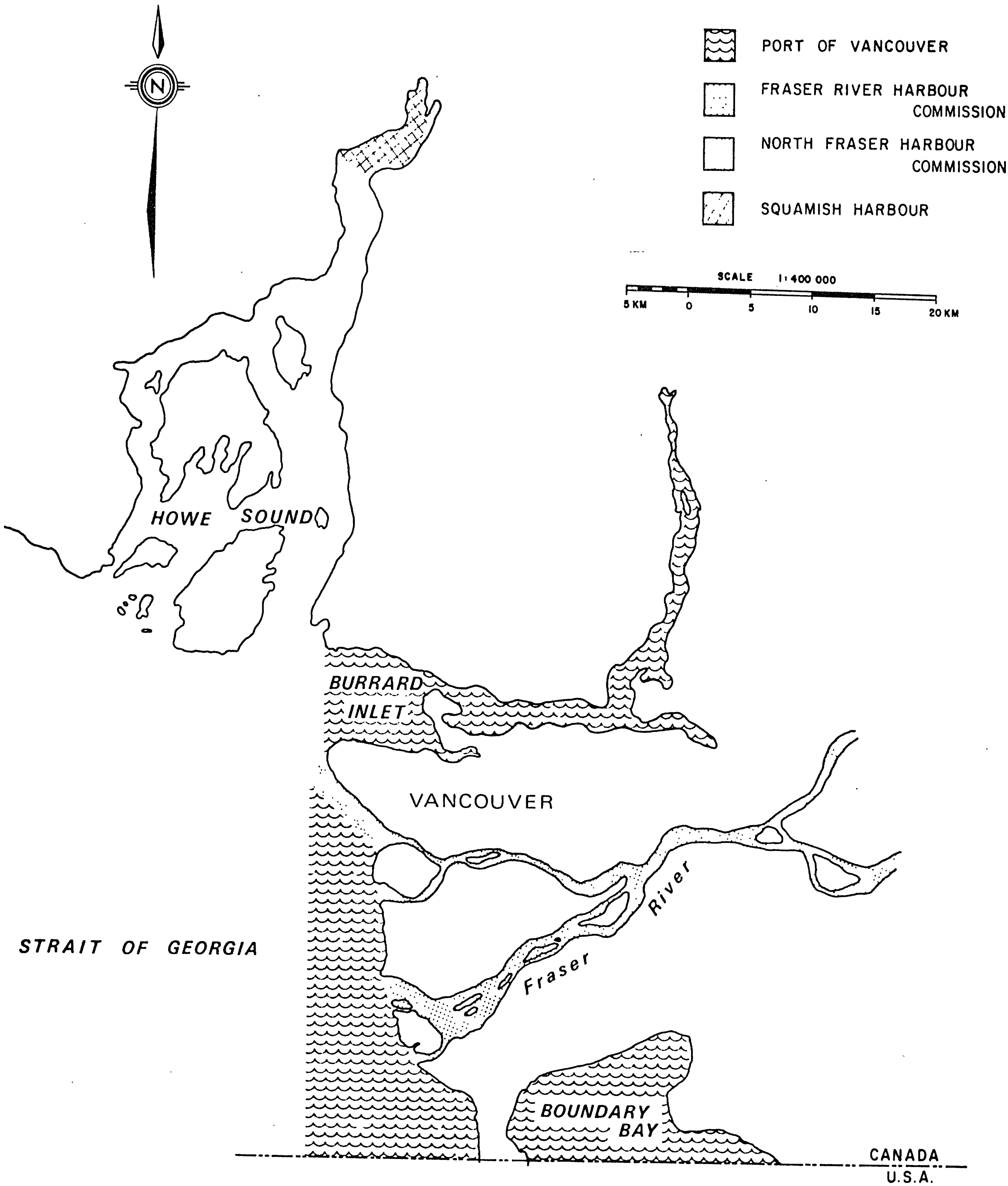
Source: "Western Ports," WESTAC Background Paper #4, September 1980.

Western Ports

Port of Vancouver--Vancouver, British Columbia, is the site of the most important of the many western Canadian ports and harbors. Indeed, in terms of its annual tonnage (45 million in 1980), Vancouver is the largest port on the west coasts of both North and South America. As previously noted, the port of Vancouver handles 50 percent of western port tonnage. The port is connected by major Canadian highways to the rest of Canada and to the United States. Of greater importance is the fact that four long-distance railroads (British Columbia, Burlington Northern, Canadian National, and Canadian Pacific) serve the port, in addition to the local railroads operated by B.C. Hydro and the B.C. Harbors Board.

The port of Vancouver has four principal bulk terminals which handle exports of coal, sulphur, and potash, and bulk imports of phosphate rock. Five terminal elevators process and load 40 percent of Canada's grain exports. Vancouver also serves as a consolidation point for lumber arriving by rail, highway, and water for subsequent export. The port also handles general cargo and containers, and is the transshipment point for imports from Pacific rim countries which are bound for eastern Canada.

Figure 8. Port Jurisdictions-Greater Vancouver Area



Source: "Western Ports," WESTAC Background Paper #4, September 1980.

As seen in Figure 8, the port is under the jurisdiction of the National Harbors Board. The areas encompassed by the port include the Burrard and Inlet, the Strait of Georgia, and the Boundary Bay regions.

The port of Vancouver is the largest of what have been termed "gateway ports." These ports are directly connected to the mainland rail network and handle most of the overseas trade of the four western provinces. Other gateway ports include Lakehead at Thunder Bay, Ontario, Fraser River in British Columbia, Prince Rupert in British Columbia, and Churchill on Hudson Bay in Manitoba. Because the three west coast ports are in such close proximity to one another, one cannot study the port of Vancouver without some attention to Fraser Port and Prince Rupert. Although the inland ports of Lakehead and Churchill are very important, especially with respect to the export of grain, they are oriented to an eastern flow of commodities, in contrast to Vancouver, Fraser River, and Prince Rupert, which have a Pacific rim orientation.

Lakehead--This port, also called Thunder Bay, is western Canada's second largest port. Located on Lake Superior, Lakehead handles 22 percent of total western port tonnage, in spite of an ice-restricted shipping season of 36 to 40 weeks per year. The port is served by two transcontinental railroads and the shipping industry of the Great Lakes. It is the West's primary grain outlet, accounting for 60 percent of all grains leaving the region.

Fraser River--As seen in Figure 8, the Fraser River harbors are in close proximity to the port of Vancouver and should be considered as part of the Greater Vancouver port complex. These harbors, identified as Fraser River and North Fraser River, are each under the jurisdiction of a separate harbor commission. Fraser Port, as the complex is often called, is a multipurpose general cargo and semibulk port. It accounts for 5 percent of total western port tonnage and is especially important as a gateway for imports of steel and automobiles.

Prince Rupert--This port is some 600 miles north and west of Vancouver and is the western Terminus of the Canadian National Railway north line. The port handles approximately 2.3 million metric tonnes of freight per year, or 2.5 percent of the western port total. It is especially important as an outlet for grain exports, currently handling 6 percent of total export tonnage. Significant expansion in activity is expected when the Ridley Island outerport bulk coal and grain terminals are developed. Although Prince Rupert port is 200 miles further west of the prairie grain centers than the other west coast ports, it is 500 miles closer by sea than the ports of Vancouver and Fraser River to the northern Pacific rim countries such as Japan.

Churchill--This special-purpose port on Hudson Bay handles about 3 percent of Canada's grain exports. Churchill has an ice-restricted season of approximately 13 weeks and is linked to the wheat producing areas of western Canada by a Canadian National Railway line. One key advantage of Churchill's location is that it is 1,000 sea miles closer to northern Europe than is Lakehead.

The Railroads in Western Canada

The western ports are linked to the rest of Canada by two transcontinental railroads, the Canadian National (CN) and the Canadian Pacific (CP). As can be seen in Figure 9, the CN line travels across the western provinces in a more northerly route than the CP. In addition, it branches off to connect such ports as Churchill and Prince Rupert to the main line. Both railroads connect with Thunder Bay in the east and Vancouver in the west; and with the addition of the Burlington Northern Railroad which runs across the northern United States, they provide the principal linkages between the sources of commodity supply in the western Provinces and the gateway ports.

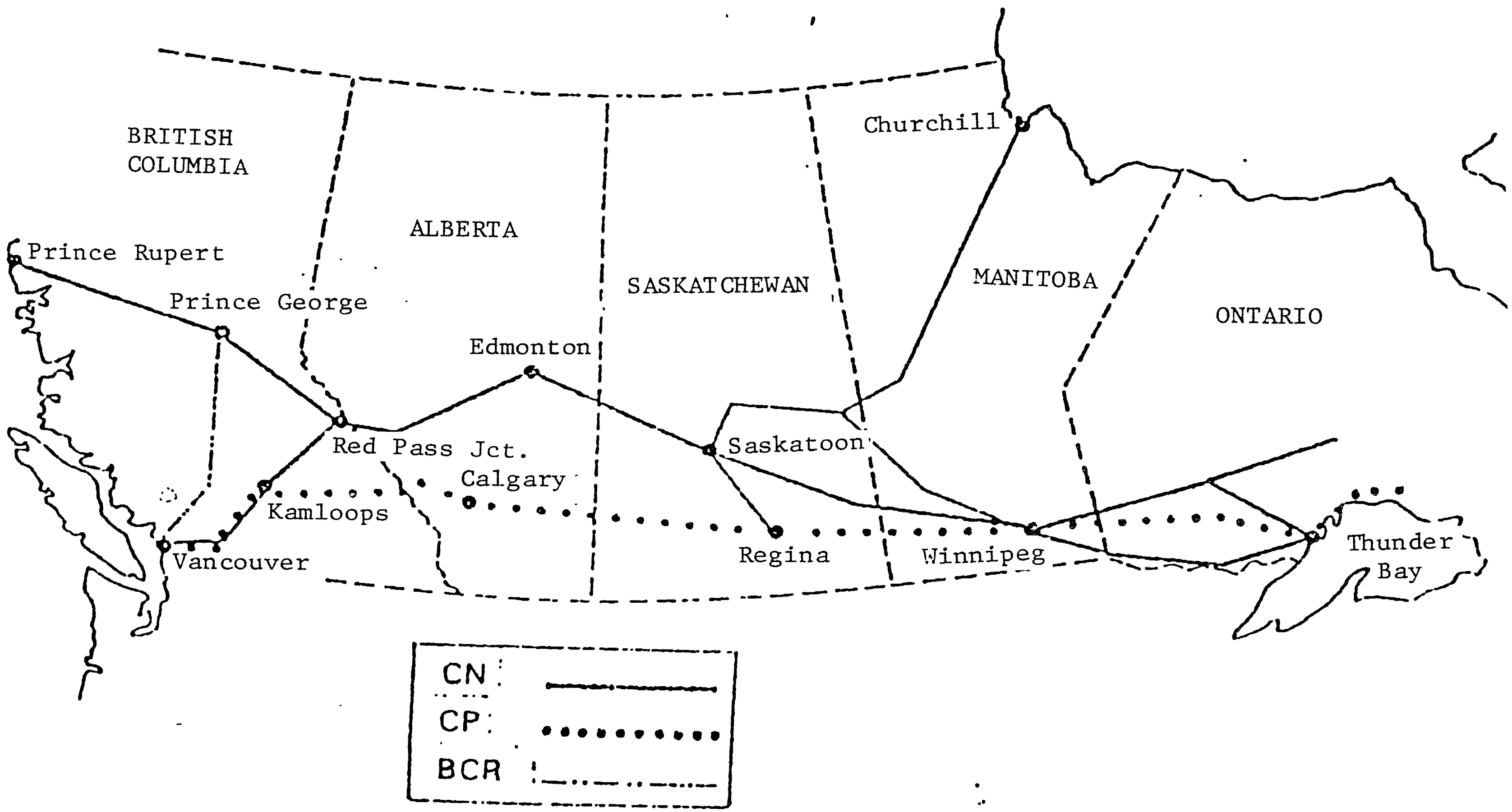


Figure 9. Canadian National and Canadian Pacific Main Line Network-Western Canada.

Rail transport trends*--Rail loadings in Canada have risen sharply over the past 15 years. This trend has been especially strong in the West, where rail loadings increased 90 percent from 51.6 million tonnes in 1965 to 98.4 million tonnes in 1978. It is predicted that this growth will continue through the 1980s, with major emphasis on bulk commodity movement from Canada's resource-based industries. A recent forecast by Transport Canada predicted a 66 percent increase in rail loadings by 1990. Details of this forecast are presented in Table 1.

Table 1. Rail Traffic Loadings--Western Canada
(In Millions of Tonnes)

Commodity	1978	1990	Percent Increase
Grain	24.6	34.0[a]	38
Fertilizer Materials	15.7	28.0	78
Coal	15.5	35.0	125
Forest Products	17.6	29.0	65
Other Commodities	25.0	37.0	48
Total	98.4	163.0	66

[a]In October 1980, the Grain Transportation Authority estimated grain loadings at 39.5 million tonnes by 1990, a 60 percent increase over 1978.

Source: Transport Canada

The central question concerning the railroads of western Canada is whether or not they will have the capacity to handle the rapidly increasing tonnage projected for the decade of the eighties. The main line network of western Canada, as illustrated in Figure 9, is of crucial importance as it is the lifeline which connects the commodity-producing western provinces to the sea. We shall look briefly at each of the two main line railroads to evaluate their situation with respect to capacity and productivity.

*Canada Grain Council, Fact Sheet #4.

Canadian Pacific*--This railroad has forecast an increase of 50 percent over its current total Canadian traffic during the 1980s. Much of this growth will occur in the West. The CP estimates its main line capacity between Calgary, Alberta, and Vancouver, British Columbia, on the basis of the number of trains it can move per day through Rogers Pass 220 miles west of Calgary. The existing capacity is 30 train movements per day (15 trains moving in each direction). In 1976 average movement was 26 trains per day. The forecast for 1989 is 38 to 40 trains per day. Thus the CP western main line is operating very close to capacity and unless capacity improvements are made soon, the Rogers Pass bottleneck will become a severe constraint on commodity movements to western ports.

CP projections are that traffic on the Calgary-Vancouver line will double by 1989. To meet this rapidly increasing need for rail services, CP has completed two grade-reduction double-track projects, with a third such project underway and a fourth planned. These improvements are illustrated in Figure 10. It is estimated that when these four projects are completed, the gradient on the Calgary-Vancouver line will be a maximum of 1 percent, or a one-foot rise per hundred feet of track. This improvement will increase freight capacity by 45 percent by allowing both more traffic and heavier trains with fewer locomotives. It is believed that these grade-reduction projects, in combination with other elements of a 10-year, $5.4-billion total capital program, will enable CP to meet traffic demands until 1990.

Canadian National--This railroad also forecasts overall system traffic growth of 50 percent in the decade of the eighties. Three-quarters of this growth will be in western Canada, with half of it occurring west of Edmonton. Indeed, bulk commodity traffic west of Edmonton is expected to nearly double by 1989.

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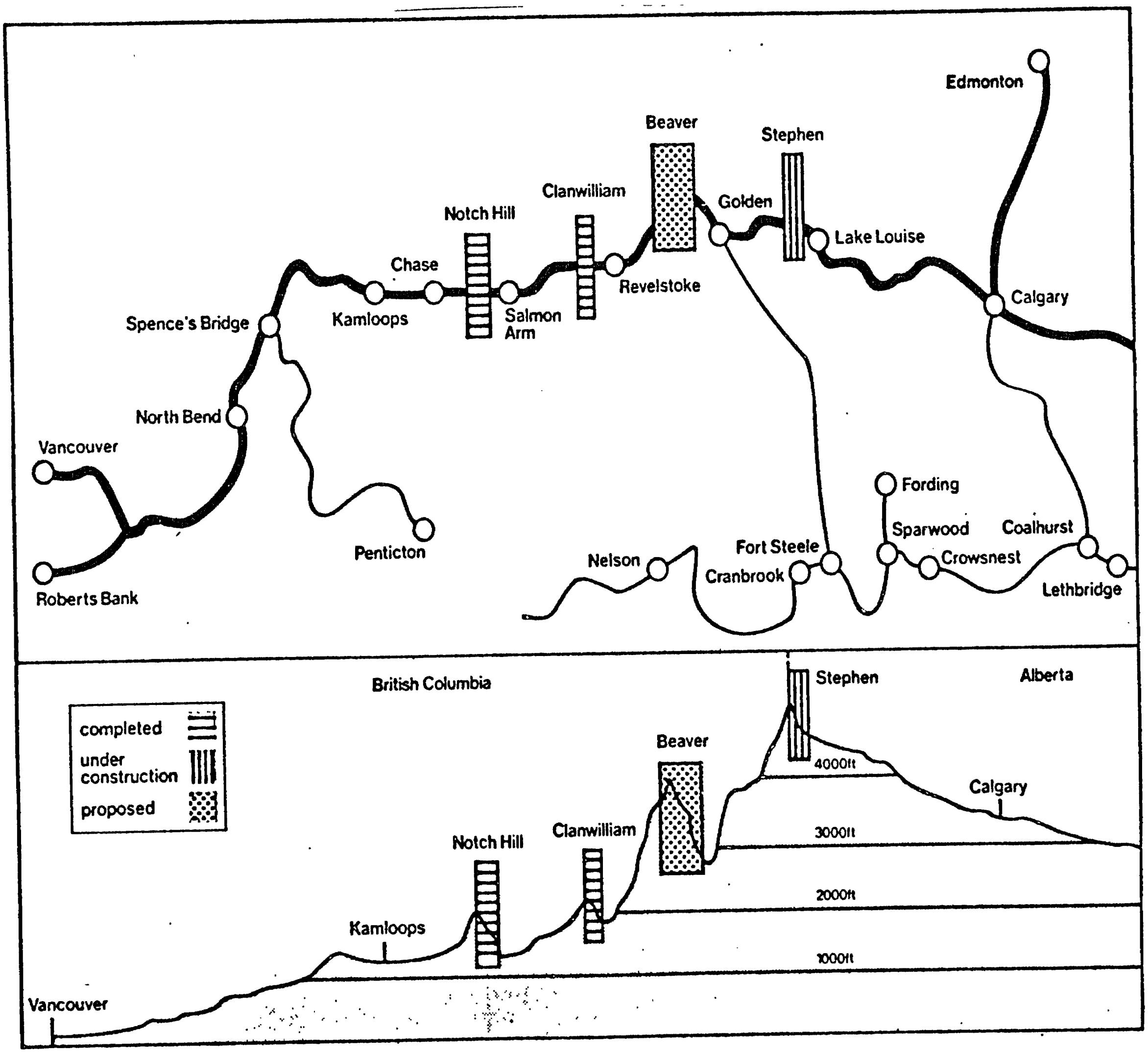
*This review is based on "Fact Sheet No. 4", Canada Grains Council.

Figure 10. CP Rail Main Line Track Improvements (Calgary-Vancouver)



Source: Fact Sheet #4, Canada Grains Council

Unlike other North American railroads, the CN does not have a gradient problem through the Rocky Mountains. The main capacity restriction is the almost 1,500 miles of single track that lies between Winnipeg and Vancouver. Partly because of the fact that its capacity constraints are different from those of the CP, the CN measures its main line capacity in terms of train weight and distance traveled. It is expressed in gross tonne miles per mile of track. Existing capacity is shown in Table 2. As can be seen, the CN is rapidly approaching capacity limits on the Edmonton-Vancouver main line.

Table 2. CN Rail Capacity in Gross Tonne Miles per Mile of Track

	Existing Capacity	1979 Traffic	1989 forecast
Edmonton-Vancouver	35/45	32/42	65/75
Red Pass-Prince Rupert	16	12	20

In the decade of the 1970s CN Rail invested $255 million to upgrade the system so that it could keep up with traffic growth. The demands on the system during the 1980s are forecast to be so great that a 10-year capital investment program of $8.5 billion has been planned. Of that amount, $6.3 billion will be used to increase the capacity of fixed plant (yards, rails, bridges, etc.) and $2.2 billion for the acquisition of new diesel locomotives and freight equipment.

Specific improvements scheduled by CN Rail west of Winnipeg include substantial double tracking as well as terminal improvement. The breakdown of projected costs by route segment is given in Table 3.

Table 3. CN Rail Capacity Expansion Program
(Winnipeg-Vancouver)

Route Segment	Cost (in Millions)
Winnipeg-Edmonton	$ 4.15
Edmonton-Valemount	4.54
Valemount-Vancouver	9.70
Terminals	2.70
Total	$21.09

Source: Fact Sheet #4, Canada Grains Council

The CN Rail north line to Prince Rupert is an unsignalled single-track line of relatively light track structure. It is operating at present near its capacity, handling 7 and 12 million gross tonne miles per mile west and east, respectively, of Prince George. To upgrade northern line capacity enough to meet the needs of a new Ridley Island grain terminal (to be served by Prince Rupert port) will require an expenditure of $200 million. If coal mines in northeast British Columbia are opened and the coal produced is sold to Japan (as is presently contemplated), an additional $200 million will be required for capacity increases.

SYSTEM OPERATION

Having described the patterns of commodity flows, and the nature of the key western ports and main line railroad linkages, our attention in this section will shift to the specific nature of several of the principal subsystems which are part of the supersystem which moves commodities from the western provinces to the gateway ports. As grain is the most important commodity, both in terms of tonnage moved and complexity of subsystem, we shall examine grain production, inland transportation, storage, grading, and export in some detail.

The Grain Subsystem*

The most unique attribute of the subsystem which moves grain from the farms of western Canada to domestic and export markets is the exceedingly large dispersion of the supply points. There are 150,000 grain-producing farms spread over 150,000 square miles of western Canada. These farms produce some 1.5 billion bushels of grain of 50 different kinds of grades. A little more than half is consumed domestically and a little less than half is exported.

From these farms, grain is hauled by truck an average of 10 miles over a network of provincial and municipal roads to 3,700 primary elevators. These elevators have a storage capacity of approximately 333 million bushels and are located at 1,500 separate railway shipping points situated on 18,700 miles of prairie railroad track. From these elevators, which are located near points of production, grain is loaded into 8,000 hopper cars and 13,000 box cars. These cars are made up into 400 branch line train runs per week and move an average of 850 miles over branch and main lines through 22 western distribution yards, 4 classification yards, and 4 port terminal yards. Ultimately, the

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*Adapted from "Grain Transportation--A System Description," WESTAC Background Paper #2, August 1978, reprinted August 1980.

grain is delivered to 20 port terminal elevators located at 4 gateway ports, as detailed below:

Ports	Number of Elevators	Storage Capacity
Prince Rupert	1	2.3 million bushels
Vancouver	4	23.5 million bushels*
Churchill	1	5.0 million bushels
Thunder Bay (Lakehead)	14	82.6 million bushels

*10 million bushels of added capacity under construction (1978 data).

It is evident that Thunder Bay is the dominant gateway port, but the eastern movement of grain does not stop there. The grain is further moved by rail and lake vessel to 27 transfer elevators with over 120 million bushels of storage capacity located at 20 St. Lawrence and East Coast points. From these points 750 million bushels of grain are loaded on 2,000 ships for export to 70 countries. Sales of this exported grain amount to $3.5 billion per year. In addition, 150 million bushels are used for domestic consumption in eastern Canada. Figure 11 illustrates the relative size and direction of grain flows from the prairie provinces.

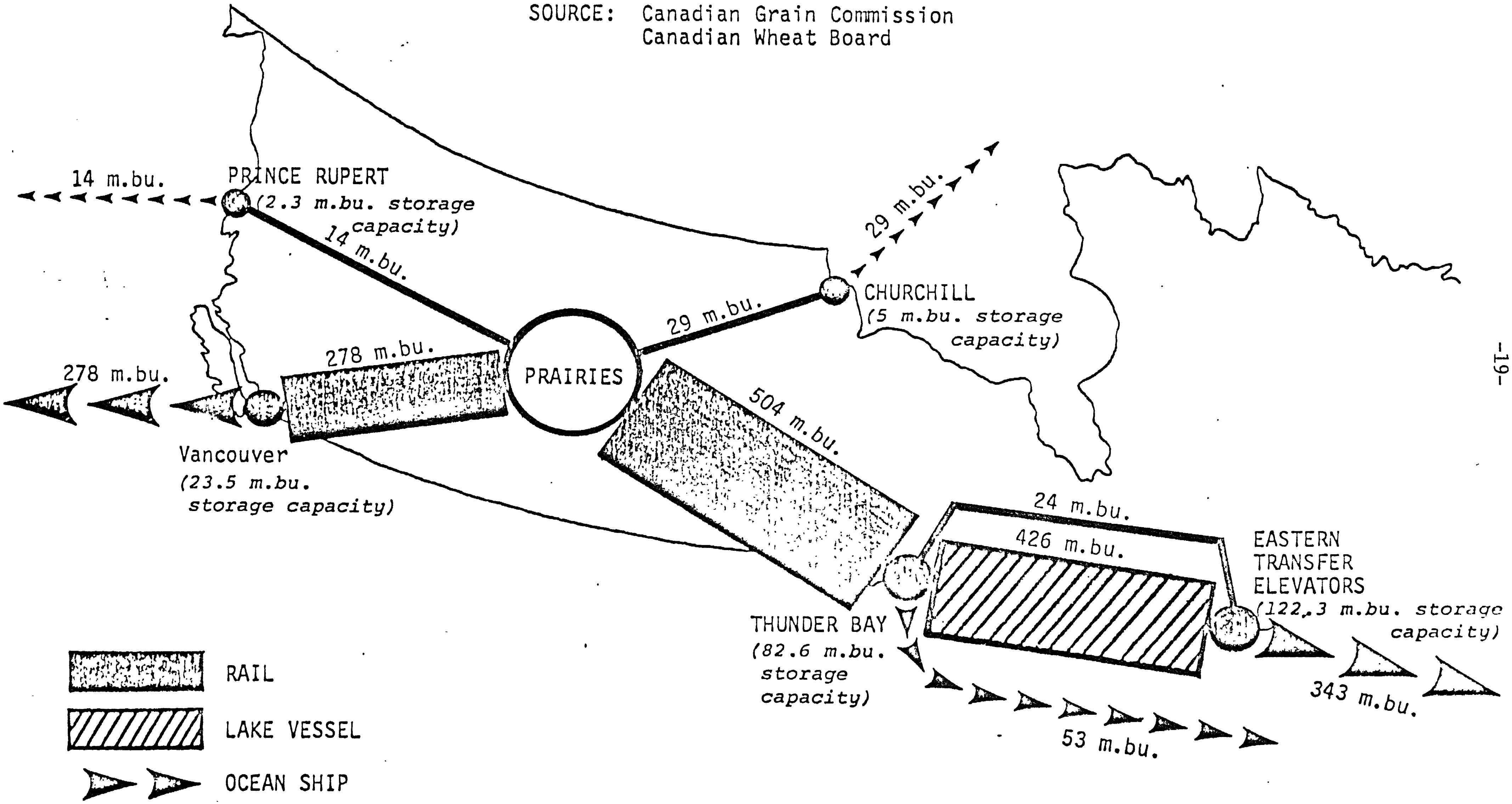
Grain production varied in the decade of the 1970s as a result of the vagaries of the weather and the changing world demand for grain. Production ranged between 25 and 40 million tonnes, with exports in the range of 12-1/2 to 21-1/2 million tonnes per year. In recent years exports have been about 20 million tonnes annually. This volume is considered to be below sales potential, and the Canadian Wheat Board reported after the 1978/79 crop year that sales could have been 25 percent higher had it not been for constraints imposed by the complete transportation and handling system. The export target level widely proposed for 1985 is 30 million tonnes, as shown in Figure 12.

Figure 11.

DIRECTIONAL FLOWS OF WESTERN GRAIN

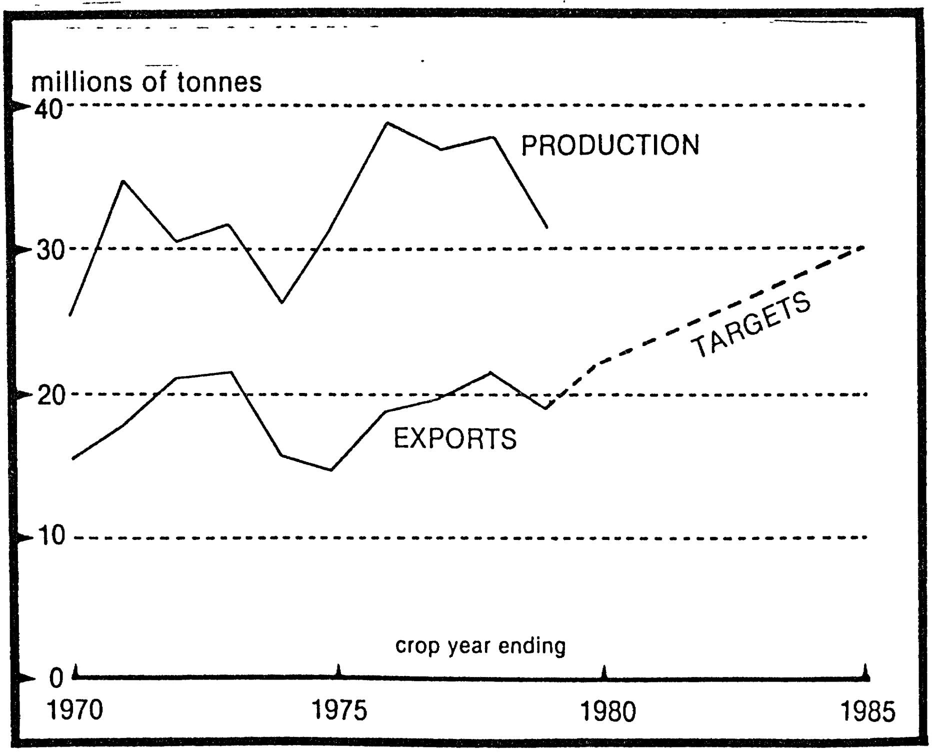
1976/1977 CROP YEAR
in millions of bushels (m.bu.)

SOURCE: Canadian Grain Commission
Canadian Wheat Board



NOTE: Rail flows to Thunder Bay (504 m.bu.) exceed exports from Lakehead and Eastern ports (396 m.bu.) because of domestic consumption in the east.

Figure 12. Grain Production, Exports and Targets (1970-1985)



Source: Canadian Grain Commission, Canadian Wheat Board (by WESTAC).

Handling and storage--Harvested grain must be stored during its journey from farms to consumers. It has been estimated that at any one time, between 10 and 35 million tonnes are in storage or transit.* Of this amount about half is stored on farms, one-third in country elevators, and one-sixth in transit or in terminal, transfer, or process facilities. Canada relies more heavily on country elevators than, for example, does the United States, although data on the decade of the 1970s indicates a 20-percent decline in country elevator capacity. Over the same period many low-capacity elevators were retired. As a result, the average capacity for elevators increased.

The dependence on country elevators rather than larger elevators located on the main rail lines has serious implications for the grain distribution

*"Grain Transportation: The Seventies in Review," WESTAC Factsheet, July-August 1980.

system. Most important is the fact that maintaining elevators which are on average 8 to 10 miles from the more than 150,000 grain-producing farms requires a huge prairie rail network of over 18,000 miles of track. To maintain and upgrade this network is beyond the financial capacities of the Canadian railroads. The railroads are prohibited from raising rates by a statute which keep the charges for shipping grain by rail to levels which were in effect in 1899; thus, they must rely on federal subsidies for maintenance and improvements.

The political popularity of maintaining country elevator availability, of continuing the prairie rail network, and of arbitrarily enforcing rates which do not cover railroad costs continues. It is, however, becoming evident to some farmers that the maintenance of old ways of doing business is costing them more money each year. For example, the low return on grain shipments, even with the help of government subsidy, causes railroads to give lowest priority to such shipments. Thus time in transit and storage is increased. Second, dependence on local elevators means that processing (especially cleaning to remove chaff and foreign particles) must be postponed, usually until the grain reaches the port terminals. This postponement not only means that excess weight is transported long distances but, of even greater importance, it slows down the movement of grain at the ports. These and other hindrances increase the total costs of moving grain to market and thus increase the amount which is deducted from the revenues received by farmers from grain sales.

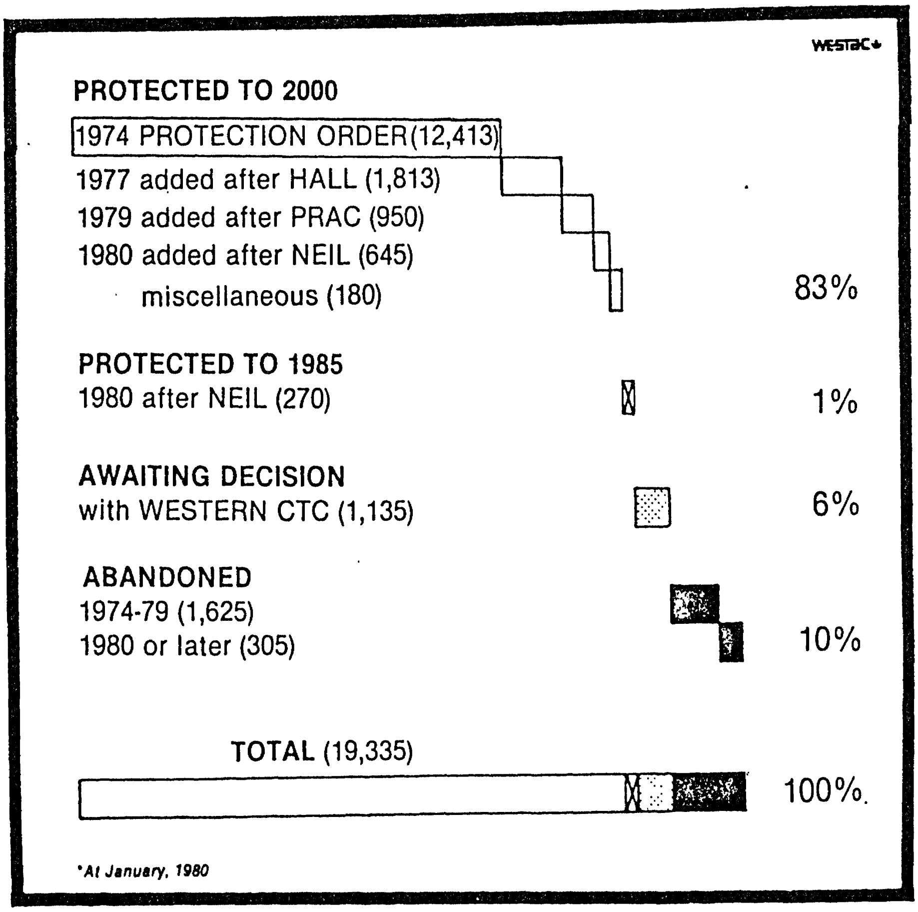
Not all grains are treated similarly. For example, wheat, barley, and oats are "board grains" which come under the control of the Canadian Wheat Board. Coarse grains and feed grains are identified as "nonboard grains" and are sold in an open marketing system. The Canadian Wheat Board (CWB) provides for "pool" marketing in which the farmer delivers his crop to the country elevator. These deliveries are controlled by a quota system administered by the CWB. The grain moves to a terminal elevator where it is weighed, graded, cleaned, and dried. The screenings are the property of the terminal owner and are sold as animal feed.

The CWB assigns rail cars to each of 48 predetermined geographic "blocks." The assignments are based on the availability of specific grades of grain in each block and the need to provide equality of opportunity to move grain from each block. At this level in the system the CWB also controls the movement of nonboard grains.

The CWB then allocates rail cars within blocks to the various grain companies. These allocations are proportional, and are based on the previous year's loadings. The grain companies, in turn, allocate cars to terminal elevators. The entire process takes about six weeks, of which four are for planning and two are for loading.

Prairie rail network*--At the beginning of the decade of the 1970s the prairie rail network consisted of approximately 20,000 miles of track, much of it in poor condition. However, 1970 also marked the beginning of claims by the railroads for federal subsidies to compensate for losses on individual branch lines, in accord with new provisions of the Railway Act. In addition, a series of governmental actions starting in the 1960s continued to protect prairie rail lines from abandonment. By 1974, 12,413 miles of the basic network had been granted protection until the year 2000. Figure 13 illustrates the timing and extent of protection offered by the federal government.

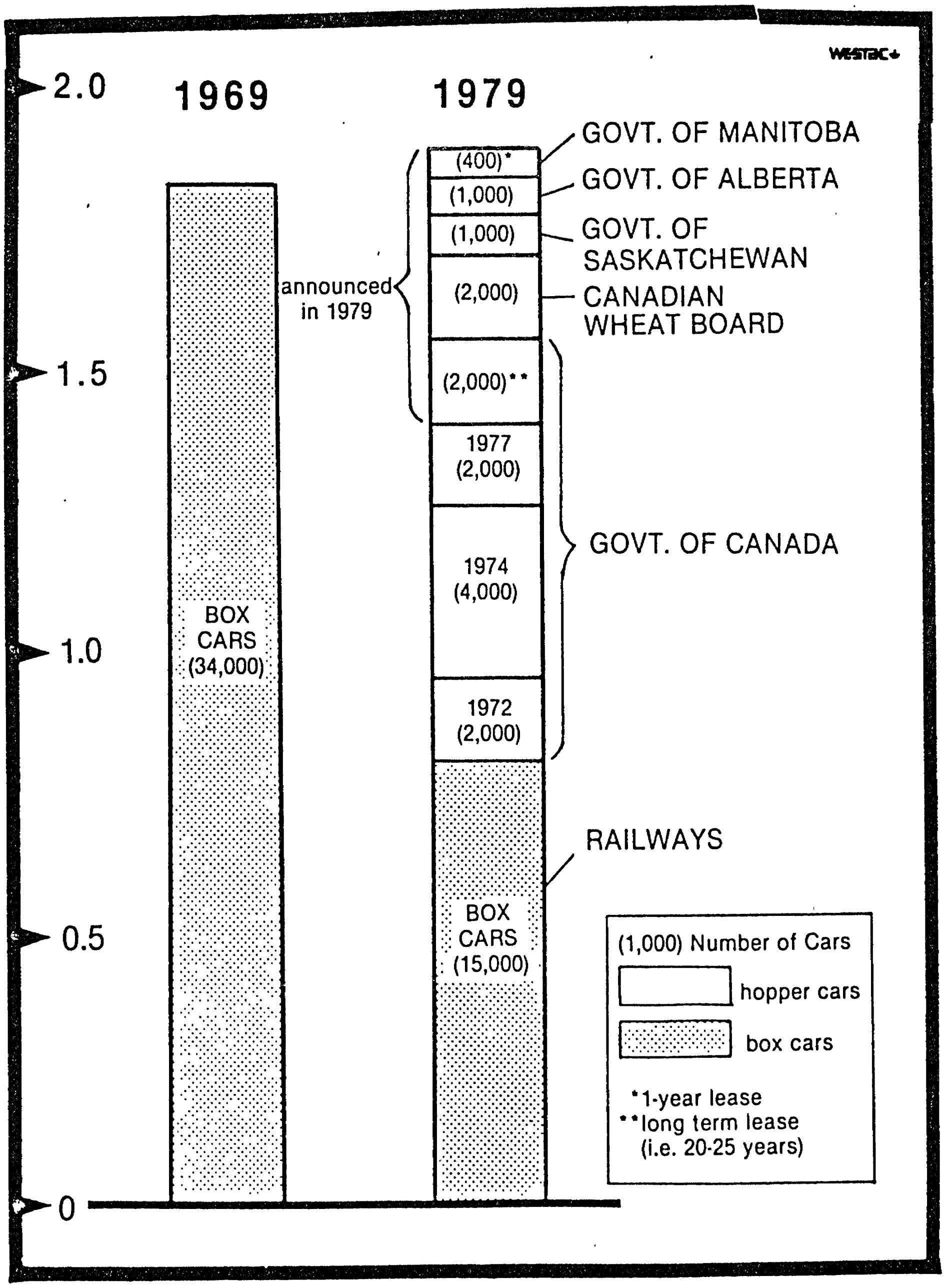
Figure 13. Prairie Rail Network*
(Mileage in Parentheses)



Source: WESTAC from data of the Western Division of the Canadian Transport Commission. Mileage figures in this chart differ from those in text because some branchline decisions differ from various study recommendations and others are still awaited.

Rail car fleet--At the beginning of the decade of the 1970s the fleet of rail grain cars consisted of 34,000 box cars owned by the railroads. Ten years later the fleet of grain cars had changed markedly with respect to car type and ownership, although the fleet maintained the same standing capacity. As seen in Figure 14, over half of the old box cars had been replaced by new hopper cars which were purchased or leased by the federal government, three provincial governments, and the Canadian Wheat Board. In addition, the federal government participated with the railroads in the rehabilitation of 8,400 box cars.

Figure 14. Grain Car Fleet
(Standing Capacity in Millions of Tonnes)



Note: a. Standing capacity estimated using average payload for box cars at 54 tonnes, hopper car at 75 tonnes

b. Some of the cars announced ordered in 1979 were on track at year end but most were slated for delivery in 1980 or later

Source: WESTAC

Management and control--During the decade of the 1970s several attempts to improve the operation of the grain system were made. These included "Operation Lift" (Lower Inventories for Tommorrow), an incentive program initiated by the federal government in 1970. The objective of the program was to encourage farmers to take land out of farm production and put it into forage crops in order to reduce the excessive amount of stored grain which was clogging the system. In the same year the block shipping system (discussed previously) was instituted by the Wheat Board. Finally, 1970 was the year in which a delivery quota system was originated to allow the Wheat Board to call for the delivery of only those types of grain demanded by the market and to ensure equality of opportunity for delivery by producers.

In 1971 Canadian Transport Commission "grain coordinators" took control of most board grain distribution in the Vancouver and Thunder Bay terminal areas. These coordinators allocated loaded cars from main rail yards to terminal elevators. A car pooling system was begun to allow the spotting of most cars loaded with board grains at any terminal with unused capacity, regardless of point of origin.

In 1976 CNR and CPR agreed to reduce cross-hauls of Vancouver-bound cars between Calgary and Edmonton by hauling each other's cars when necessary. A similar agreement for cars bound for Prince Rupert was concluded in 1980.

In October 1979, The Minister of Transport appointed a Grain Transportation Coordinator with broad powers to allocate cars and oversee the system, in hopes of achieving a 50-percent increase in grain exports by 1985.

Coal

In terms of tonnage and dollar value, coal is second only to grain in its importance as an export through Canadian west coast ports. In 1980, for example, coal production was estimated to be 33.4 million tonnes, with approximately 14 million tonnes being exported through Vancouver and other west coast facilities. As shown in Table 4, the production of coal is expected to increase greatly in the future as world demand grows. Of special importance to west coast ports is the growing appetite for Canadian coal of Pacific rim countries such as Japan and Korea. Countries such as Brazil, West Germany, Denmark, Romania, Italy, and Spain are also important and growing users of Canadian coal.

Governmental and industry forecasts suggest that by 1990 coal production could exceed 80 million tonnes, with exports being in the range of 38 to 52 million tonnes. One of the reasons for this forecasted increase is that while exports in the 1970s consisted mainly of metallurgical coal for making iron and steel, exports in the 1980s will include growing amounts of thermal coal used in the generation of heat and electricity. Since British Columbia and Alberta have large deposits of thermal coal, the west coast ports will be very busy in the years ahead.

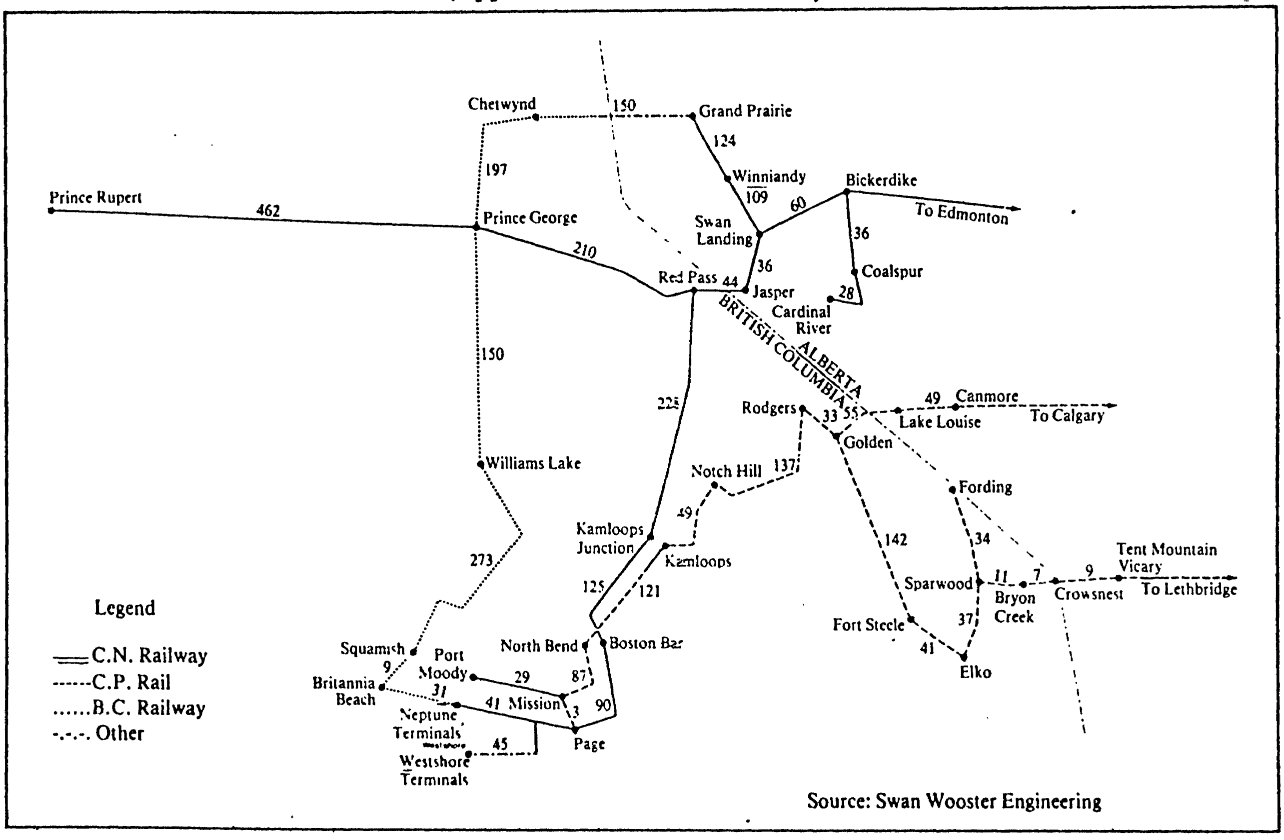
Table 4. Estimated Coal Production Forecasts
(Millions of Tonnes)

Province	Area	To	1980	1985	1990	1995	2000
B.C.	Mtns.	Local	0.1	0.6	3.6	9.5	15.3
		Coast	9.8	15.0	24.0	29.5	34.0
		Ont.	0.5	1.5	1.7	2.8	2.8
Alta.	Mtns.	Coast	4.3	8.7	12.2	17.2	22.2
		Local					
		Ont.	1.8	1.9	1.9	2.1	2.1
	Plains	Local	10.5	18.4	26.3	41.9	55.8
		Ont.					
Sask.	Plains	Local	5.7	8.8	12.0	15.1	20.9
		Ont.	0.7	0.9	0.9	0.9	0.9
	TOTALS		33.4	55.8	82.6	119.0	154.0

Source: Western Canada's Coal: "The Sleeping Giant" (Calgary: Canada West Foundation, 1980), p. 110.

Transportation--As is the case with grain, the railroads are the primary means of moving coal from the mines to the western ports. The Canadian Pacific Canadian National, Burlington Northern, and British Columbia railroads are the principal entities involved, although there are some smaller lines which provide for local movement. Figure 15 illustrates the export coal rail network and the location of the major ports and terminals. CP Rail carries the bulk of the coal from southeastern British Columbia and southwestern Alberta to tidewater at Vancouver, while CN Rail hauls coal from the northern mountains and foothills of Alberta.

Figure 15. Rail Network Export Coal Routes
(Approximate Route Miles)



CP Rail has the more adverse terrain, with grades of up to 2.2 percent, but carries more coal (9 million tonnes per year) than does CN Rail (4 million tonnes per year). As noted previously, considerable work will be required to upgrade these rail lines enough to accomodate the growing coal traffic.

Another potential rail route is the CN Rail northern main line from Red Pass Junction through Prince George to tidewater at Prince Rupert. There are plans to build a major bulk terminal at Ridley Island five miles east of Prince Rupert. These plans are contingent upon the development of the British Columbia coalfields to accommodate a Japanese proposal to buy large quantities of coal over a long time span.

B.C. Rail has access to tidewater at Britannia Beach and Squamish, and can also interchange with CN Rail at Prince George for movement to Prince Rupert. This route is not likely to be heavily used for several years, and until the development of Ridley Island, BC Rail will continue to move coal from the Pease River coalfields to Neptune Terminals in North Vancouver. This route is a difficult one and trains are limited to 7,200 net tonnes or 80 cars.

Coal terminals--The three principal coal terminals in British Columbia are all located in the Vancouver area. They are the Pacific Coast Terminals, the Neptune Bulk Terminals, and the Westshore Terminals. Table 5 illustrates the present throughputs and capacities of these terminals. As can be seen, the Westshore Terminals at Roberts Bank are operating very close to present capacity. This facility is almost completely automated and handles unit trains of approximately 150 cars which arrive on a regular basis from mines in the East Kootenays. The cars are automatically turned to unload their contents on conveyor belts, after which the coal is loaded on ships through enclosed pipes. A workforce of 85 persons operates this facility 24 hours a day and 7 days per week.

Table 5. Characteristics of British Columbia Coal Terminals

Name	Present Annual Throughput (Tonnes per Year)	Present Annual Capacity (Tonnes per Year)	Potential Annual Capacity (Tonnes per Year)	Ship Size (DWT)	Rail Connections
<u>Operating Terminals</u>					
Pacific Coast Terminals	1,500,000	2,000,000	3,500,000	65,000	Canadian Pacific
Neptune Bulk Terminals	3,000,000	6,000,000	7,000,000	90,000	B.C. Rail Canadian National
Westshore Terminals	8,800,000	9,600,000	12,000,000	120,000	Burlington Northern Canadian National Canadian Pacific
Total	13,300,000	17,600,000	22,500,000		

Source: *Western Canada's Coal*, op. cit.

There are plans underway to expand the Roberts Bank facilities by adding two or possibly three new terminals of the same size as the present one (20 hectares), thus greatly increasing capacity. It has been estimated that by adding two stages each to Westshore (Roberts Bank) and Ridley Island (Prince Rupert), potential west coast coal-handling capacity could be increased from 22.5 million tonnes to 62.5 million tonnes per year.

It appears that coal exports, like grain exports, will increase greatly in the years ahead. In the case of coal, however, the main bottlenecks are rail and terminal capacity limitations, and not the institutional and political problems which have developed over the years because of the thousands of individual farm entities which supply agricultural commodities. This is not to say that increasing coal capacity will be accomplished effortlessly. Indeed, the Japanese proposal to purchase large quantities of coal from as yet undeveloped British Columbia sources raises the question of who is to pay for the external costs associated with large-scale mining operations and the development of rail linkages between the mines and tidewater ports.

Potash

The province of Saskatchewan produced 7 million tonnes of potash in 1979. Of this amount, a little over half was exported through the gateway ports of Vancouver (3.2 million tonnes) and Lakehead (.4 million tonnes). Over two-thirds of the Canadian potash produced is sold to the U.S. The second largest market (approximately 25 percent of the total produced) is offshore and is served principally though the port of Vancouver. Principal buyers include Japan, India, Korea, and Brazil. The transportation and marketing of potash are under the control of a cooperative venture called canpotex.

Rail transport is very important in moving potash from Saskatchewan to the ports or to the U.S. The demand for potash is seasonal, as it is principally used as a fertilizer, and peak demand periods place a burden on rail lines with limited car supply. On the main line runs from the mines of Saskatchewan to Vancouver, CPR uses 85 car trains while CNR uses 53 car trains. The CNR run is direct, while CPR consolidates with a 53-car sulphur train at Calgary. This is a "solid" rather than a unit train operation.

Upon arrival in Vancouver the potash is moved to two major bulk terminals where it is unloaded and stockpiled before being transferred to ships. Potash must be stored in enclosed sheds or silos. Neptune Terminals and Vancouver Wharves have approximately 150,000 tonnes of this type of storage.

Each carload of potash is unloaded on a conveyor. The various grades of potash are segregated and transferred to storage locations. One train load of potash can be unloaded in an eight-hour shift. Most shipments out are in quantities of 30,000 tonnes or less. The shipments of potash are usually combined with other commodities such as sulphur to make a shipload of 50,000 to 65,000 DWT. A 30,000-tonne quantity of potash could be loaded in an eight-hour shift. At present, there appear to be no capacity problems with respect to handling potash in Vancouver. Present estimates suggest that over 400,000 tonnes of potash could be handled by the combined terminal capacity. The major problem in the distribution of potash is the seasonality of demand, which requires the use of large numbers of rail cars in December, January, and early spring.

IMPLICATIONS

On the basis of a preliminary investigation it appears that the distribution system currently in use in Canada to move key commodities to western gateway ports is highly developed and operating with reasonable efficiency. Because demand for Canadian exports is growing and international trade is so important for the country, every economically justifiable attempt should be made to increase system efficiency and enlarge its capacity where needed.

Although some of the west coast ports are approaching the limits of their throughput capacities and most have less storage capacity than similar ports in other countries, plans are being made to improve operating efficiency and to expand capacity where needed. Of special importance are the Roberts Bank (Vancouver) and Ridley Island (Prince Rupert) proposals. In greater Vancouver, new institutional arrangements between labor and management and continued cooperation among the railroads will be needed to gain the productivity increases that will reduce the need for port expansion. Such expansion would be most costly and difficult, given the intense pressure for land use for commercial, residential, and recreational purposes.

Although the railroad system in western Canada is outstanding, there is room for improvement. Some portions of the prairie network need upgrading while the main lines need capacity improvement, especially where they travel over mountainous terrain. Grade reduction, double tracking, improved signals, and heavier-duty roadbeds are all parts of the task which must be completed if Canada is to meet growing export demand. The rail car shortage problem seems to be nearing solution as a result of the joint actions of the railroads, the federal and provincial governments, and the Canadian Wheat Board.

In all, the observer from the United States sees an infrastructure which is highly advanced technologically but which has some problems with capacity and efficiency. Because of the close involvement of government at all levels in the commodity distribution system, the resources for handling the most pressing physical limitations and bottlenecks appear to be available. There is, however, another set of constraints which are institutional in nature and which require political action to ameliorate.

The first of these constraints on the system is the retention of the local elevator-prairie rail network approach to grain collection and distribution. Combined with the noncompensatory rail rates set by statute, this local elevator system requires massive government subsidies to railroads without necessarily conferring compensatory economic benefits to producers or consumers. There is some evidence that farmers are beginning to comprehend that their best interests are not being served by the Crow Rate and that the trade-offs between transport and other costs in the system (especially those associated with system delays) are not always in their favor.

Second, there are many problems at the interface between the railroad and the port terminal facilities. Some of these are caused by congestion in the switching yards, others by inadequate storage or loading facilities, and still others by the large number of management and labor constituencies. Indeed, a major problem in Vancouver is that while the railroads operate seven days a week, many port facilities operate only five days a week.

Although the task force approach has been successful in arranging for cooperation among the railroads and associated labor unions to improve switching efficiency and to reduce cross-hauls, a great deal of work remains to be done in order to overcome institutional rigidities. In the opinion of the author, the political, economic, and social restraints which impact so heavily upon system performance will be more difficult to overcome than will be the problems impact by limitations of a physical nature.

Regardless of causation, problems which limit the ability of Canada to meet export demand for its agricultural and mineral riches must be addressed and resolved. The future of Canada and many of its trading partners will depend upon how effectively the Canadian commodity distribution system can supply a rapidly increasing world population with food, energy, minerals, and forest products.