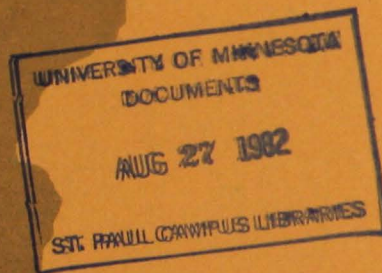


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MINNESOTA GRAIN MOVEMENTS IN THE SEVENTIES: CHANGING TRENDS



Agricultural Extension Service
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Minnesota Department of Transportation

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MINNESOTA GRAIN MOVEMENTS IN THE SEVENTIES:
CHANGING TRENDS

Extension Bulletin 472-1982

by

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May 1982

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INTRODUCTION

The 70's was a decade of great change and adjustment for the Upper Midwest grain marketing and transportation system. The Russian grain agreement in 1972, a change in government policy from one of production restrictions to all out production, and an aggressive export promotion program pushed the existing transportation system to its limits. Overall, the transportation system performed adequately as cash grain moving within and out of the region reached record highs, with peaks in 1973, 1978 and 1979.

Railroads responded to the increased grain demand by introducing multiple-car and unit-train rates for volume grain movements. This resulted in better utilization of rail cars as turnaround times and switching expenses were reduced. Payloads were increased as 100-ton covered hoppers replaced the smaller, less efficient boxcars.

The trucking industry responded by increasing its share of the country elevator to terminal elevator traffic. In 1970, only 47 percent of all grain shipped to the Twin Cities was by truck. In 1979, trucks' share of the much larger quantity of grain received in the Twin Cities was 73 percent. Similarly, trucks accounted for only 33 percent of the grain received in Duluth/Superior in 1970, but 49 percent of the much larger volume in 1979.

Water modes of transportation, both barge and vessel, had record loading years during the decade. Barge grain traffic originating from river terminal elevators in the Twin Cities (and Savage) exceeded five million metric tons in 1974, 1978 and 1979. Grain shipments by vessel from the port of Duluth/Superior exceeded eight million metric tons in 1973, and peaked in 1978 as grain shipments totaled 9.2 million metric tons.

Although record volumes of Upper Midwest grain moved into domestic and foreign markets during the decade, the performance of the transportation system was not without problems. Problems of a short-run or cyclical nature included periodic shortages of railcars, trucks or barges, rail embargoes of crowded ports, a grain embargo on Russia and the 1979 Grain Millers Strike in Duluth/Superior. Developments with long-run implications included the bankruptcies of the Rock Island Companies, large scale branchline abandonments, and capacity constraints at Lock and Dam 26 in Alton, Illinois. Lock and Dam 26 has been operated at capacity since 1976, at times resulting in three-day waits for southbound grain. This bottleneck will continue until about 1990. Table 1 shows the number of branchline miles abandoned in Minnesota from 1970 through 1981.

A chronology of major events and developments which affected the volume and direction of Upper Midwest grain flows is given below.

Chronology of Major Events

- 1970 - Corn Blight. Formation of the Burlington Northern by merger.
- 1972 - Introduction of unit train rates applying to corn and soybeans for export via the Gulf of Mexico. First year of the Russian

- Grain Agreement permitting the Soviet Union to buy up to 27 million metric tons of grain during the fiscal years 1972-73 and 1973-74.
- 1973 - Second year of Russian Grain Agreement. Record exports. Arab oil embargo doubled fuel prices.
 - 1974 - Port of Duluth plagued by terminal elevator strike, lake shipping strike and an accident at Welland Canal. Record barge loadings out of the Twin Cities.
 - 1975 - Rock Island Railroad files for bankruptcy. Five-year agreement committing the USSR to purchase a minimum of six million metric tons and up to 27 million tons a year beginning October 1976.
 - 1976 - Drought severely reduced corn and soybean yields. Record wheat harvest.
 - 1977 - Milwaukee Road bankruptcy.
 - 1978 - Severe rail-car shortages. Record grain movements.
 - 1979 - Grain Millers Strike in Duluth/Superior. Rock Island Railroad strike. Record corn harvest. Milwaukee road near collapse.
 - 1980 - Grain embargo on Russia. Rock Island Railroad ordered liquidated.

Purpose of Report

The general purpose of this report is to provide, in a descriptive manner, a historical baseline document describing grain transportation in Minnesota and the major changes that occurred. Emphasis is placed on the major grain routes and the changing roles of each mode of transportation. The period of analysis is the decade of the 70's.

The report is presented in six sections. The first three sections evaluate the predominance of the Twin Cities area and Duluth/Superior markets to the Upper Midwest and the multi-modal character of grain being moved into and out of these two markets. Sections four and five evaluate two major developments in the 70's which have affected how and where Minnesota grain is marketed. Section six discusses grain transportation problems and prospects in the 80's. More specifically:

Section 1 analyzes the importance of the Twin Cities and Duluth/Superior markets to Minnesota and neighboring states in terms of grain received in these markets compared to total area production.

Section 2 analyzes the volume of grain transported into the Twin Cities area and Duluth/Superior over time, emphasizing the volumes carried by trucks and railroads.

Section 3 analyzes the volume of grain shipped out of the terminal elevator markets in the Twin Cities area and Duluth/Superior and the relative volumes carried by barges, railroads, and vessels.

Section 4 describes the recent but dramatic growth in the volume of corn and soybeans received by terminal elevators located in Red Wing and Winona.

Section 5 analyzes the trend toward multiple-car and unit-train loading country elevators and the increased volume of grain shipped directly between Minnesota country elevators and deepwater ports at the Gulf and more recently in the Pacific Northwest.

Section 6 summarizes and discusses grain transportation problems and prospects in the 80's.

Sources of Data

Data obtained in this report were obtained from the Minneapolis Grain Exchange Annual Report(s) 1970-79, Waterborne Commerce of the United States, and two surveys of Minnesota grain firms conducted by the Department of Agricultural and Applied Economics, University of Minnesota.

Table 1

Mileage of Rail Abandonments by Year
(1970-81)

1970	-----	164.8
1971	-----	33.7
1972	-----	177.19
1973	-----	36.94
1974	-----	9.38
1975	-----	69.05
1976	-----	94.94
1977	-----	162.02
1978	-----	170.51
1979	-----	60.3
1980	-----	519.43
1981 (Nov. 1)	-----	176.62

TOTAL 1,674.88

SECTION I

THE PREDOMINANCE OF THE TWIN CITIES AND DULUTH/SUPERIOR GRAIN MARKETS

The Twin Cities and Duluth/Superior are the predominant market outlets for country elevators located in Minnesota and the Dakotas. The gathering - west to east - movement of grain to these two markets is facilitated by an extensive highway and railroad system. The Twin Cities market, strategically located at the head of navigation on the Mississippi River, is both a major grain processing center and a transshipment point for cash grain entering foreign and domestic markets. Duluth/Superior, strategically located on the western edge of the Great Lakes, is a major export port. Grain not exported moves via vessel to New York and Ohio for processing or via rail to processors in the East.

This section analyzes the predominance of the Twin Cities and Duluth/Superior markets to the Upper Midwest by comparing the combined volume of grain received in these two markets to the volume of grain produced in the market area. The Twin Cities market throughout this report includes terminal elevators and grain processors located in the Twin Cities, Shakopee, Hastings and Fridley. Grain receipts are based on the calendar year.

Corn - Table 2

The large share of cash corn marketed in the Twin Cities and Duluth/Superior originates in the southern half of Minnesota. Combined corn receipts in the Twin Cities and Duluth/Superior were greatest in 1973 (210 million bushels) and 1979 (194 million bushels) when export demand was strong, and lowest in 1977 (84 million bushels), a year of inventory rebuilding following a year of severe drought. The volume of corn marketed in these two markets, as a percent of Minnesota production, ranged from 14 percent in 1977 to 43 percent in 1974. Over the decade, roughly 28 percent of Minnesota corn produced was marketed in the Twin Cities and Duluth/Superior. Roughly 46 percent of production in the 10 year period was used on the farm where produced for livestock feed. Corn not used on the farm where produced, fed locally or marketed in the Twin Cities or Duluth/Superior was shipped directly out-of-state by country elevators via rail, or trucked to river terminal elevators in Red Wing and Winona for transshipment via barge to the Gulf of Mexico.

Table 2

Corn Production, On-Farm Use and Terminal Elevator Receipts
(1970-79)

<u>Year</u>	<u>Minnesota Production</u> million bushels	<u>Used On-Farm Where Produced</u>		<u>Terminal Elevator Receipts</u>	
		million bushels	(%)	million bushels	(%)
1970	384	177	(46)	123	(32)
1971	475	252	(53)	98	(21)
1972	456	214	(47)	117	(26)
1973	513	205	(40)	210	(41)
1974	360	166	(46)	156	(43)
1975	407	187	(46)	100	(25)
1976	330	159	(48)	102	(31)
1977	600	276	(46)	84	(14)
1978	644	276	(43)	157	(24)
1979	<u>606</u>	<u>273</u>	<u>(45)</u>	<u>194</u>	<u>(32)</u>
TOTAL	4,775	2,185	(46)	1,341	(28)

Source: Field Crops, USDA and Minneapolis Grain Exchange Annual Reports, 1970-79.

All Wheat - Table 3

The majority of wheat (including durum) produced in Minnesota and the Dakotas is shipped to Duluth/Superior and the Twin Cities either for processing or transshipment via rail, vessel, or barge to foreign and domestic markets. The combined volume of wheat received in these two markets, as a percent of regional production (Minnesota, North Dakota and South Dakota), ranged from 43 percent in 1971 to 89 percent in 1970. During the 70's, roughly 69 percent of the wheat produced in the tri-state region was marketed in these two markets. Receipts were greatest in 1973 (313 million bushels), 1978 (327 million bushels) and 1979 (316 million bushels).

Table 3

All Wheat Production and Terminal Elevator Receipts
(1970-79)

<u>Year</u>	<u>Minnesota, North Dakota, South Dakota Production</u> million bushels	<u>Terminal Elevator Receipts</u>	
		million bushels	(%)
1970	219	196	(89)
1971	417	181	(43)
1972	321	275	(86)
1973	380	313	(82)
1974	349	226	(65)
1975	415	299	(72)
1976	458	249	(54)
1977	434	276	(63)
1978	439	327	(74)
1979	<u>403</u>	<u>316</u>	<u>(78)</u>
TOTAL	3,835	2,658	(69)

Source: Field Crops, USDA and Minneapolis Grain Exchange Annual Reports, 1970-79.

Soybeans - Table 4

Minnesota soybeans are either processed domestically (primarily in-state) or exported. Roughly 40 percent of Minnesota soybean production in the 70's was marketed in the Twin Cities for processing or transshipment via barge to the Gulf of Mexico, and Duluth/Superior for export. The Twin Cities is the predominant market. Receipts were greatest in 1978 (72 million bushels) and lowest in 1975 (28 million bushels). Receipts as a percent of Minnesota production ranged from 25 percent in 1973 and 1977 to 67 percent in 1971. Most of the soybeans not marketed in either the Twin Cities or Duluth/Superior were marketed to processors in Dawson, Mankato, and Red Wing. A smaller (but growing) share was shipped by country elevators in southern Minnesota via rail direct to the Gulf of Mexico for export.

Table 4

Soybean Production and Terminal Elevator Receipts
(1970-79)

<u>Year</u>	<u>Minnesota</u>	<u>Terminal Elevator</u>	
	<u>Production</u>	<u>Receipts</u>	
	million bushels	million bushels	(%)
1970	79	52	(66)
1971	64	43	(67)
1972	90	36	(40)
1973	127	32	(25)
1974	84	43	(51)
1975	93	28	(30)
1976	66	29	(44)
1977	134	33	(25)
1978	146	72	(49)
1979	163	55	(34)
TOTAL	1,046	423	(40)

Source: Field Crops, USDA and Minneapolis Grain Exchange Annual Reports, 1970-79.

Barley - Table 5

Roughly 55 percent of the barley produced in Minnesota and the Dakotas was marketed in the Twin Cities and Duluth/Superior in the 70's. Terminal elevator receipts (including maltsters) were greatest in 1973 (95 million bushels) followed by 1976 (88 million bushels) and 1977 (88 million bushels). As a percent of area production, receipts in these two markets ranged from 34 percent in 1978 to 86 percent in 1970. Roughly one-fourth (24 percent) of area production is used on the farm where produced.

Table 5

Barley Production, On-Farm Use and Terminal Elevator Receipts
(1970-79)

<u>Year</u>	<u>MN, ND, SD Production</u> million bushels	<u>Used On-Farm Where Produced</u>		<u>Terminal Elevator Receipts</u>	
		million bushels	(%)	million bushels	(%)
1970	100	26	(26)	86	(86)
1971	160	40	(25)	74	(46)
1972	159	33	(21)	86	(54)
1973	165	40	(24)	95	(58)
1974	96	19	(20)	77	(80)
1975	125	30	(24)	57	(46)
1976	123	29	(24)	88	(72)
1977	181	47	(26)	88	(49)
1978	186	43	(23)	64	(34)
1979	<u>138</u>	<u>33</u>	<u>(24)</u>	<u>72</u>	<u>(52)</u>
TOTAL	1,433	340	(24)	787	(55)

Source: Field Crops, USDA and Minneapolis Grain Exchange Annual Reports, 1970-79.

Oats - Table 6

Oat production in the 70's in the tri-state region (Minnesota, North Dakota and South Dakota) ranged from 182 million bushels in 1976 to 419 million bushels in 1971. Oat receipts, as a percentage of area production, ranged from 14 percent in 1977, to 34 percent in 1974. An estimated 21 percent of production in the 70's was marketed in the Twin Cities or Duluth/Superior markets. Roughly 59 percent of production was used on-farm where produced during the period.

Table 6

Oat Production, On-Farm Use and Terminal Elevator Receipts
(1970-79)

<u>Year</u>	<u>MN, ND, SD</u> <u>Production</u>	<u>Used On-Farm</u> <u>Where Produced</u>		<u>Terminal Elevator</u> <u>Receipts</u>	
	million bushels	million bushels	(%)	million bushels	(%)
1970	390	211	(54)	73	(19)
1971	419	226	(54)	81	(19)
1972	328	189	(58)	71	(22)
1973	317	179	(56)	88	(28)
1974	219	131	(60)	74	(34)
1975	255	157	(62)	48	(19)
1976	182	116	(64)	40	(22)
1977	354	203	(57)	50	(14)
1978	227	167	(74)	48	(21)
1979	216	143	(66)	30	(14)
TOTAL	2,907	1,722	(59)	603	(21)

Source: Field Crops, USDA and Minneapolis Grain Exchange Annual Reports, 1970-79.

SECTION II

GRAIN SHIPMENTS TO THE TWIN CITIES AND DULUTH/SUPERIOR: RAIL VS. TRUCK

This section analyzes the movement of grain to the Twin Cities and Duluth/Superior in the 70's, emphasizing the volume received in each market and the relative shares carried by trucks and railroads over time.

Trucking

The major development in the Upper Midwest country elevator-to-terminal elevator movement in the 70's was the increased utilization of trucks. This trend was particularly apparent in the shipment of grain to the Twin Cities. Although rail-car shortages and branchline abandonments worked against the railroad industry, they were not the only reasons the trucking industry grew in importance. A study¹ by the University of Minnesota comparing single-car rail rates and truck rates for corn from each country seat to the Twin Cities found:

- 1) In 1970, in most of the state, the rail rate was equal to or less than the truck rate;
- 2) In 1973, immediately after the jump in fuel price, rail rates were generally lower than truck rates; and
- 3) Since 1975, truck rates have been lower than single-car rail rates.

Although railroads were the predominant carrier for shipments to Duluth/Superior in every year in the 70's, the relative share carried by trucks increased to 49 percent of the much larger volume in 1979.

Railroads

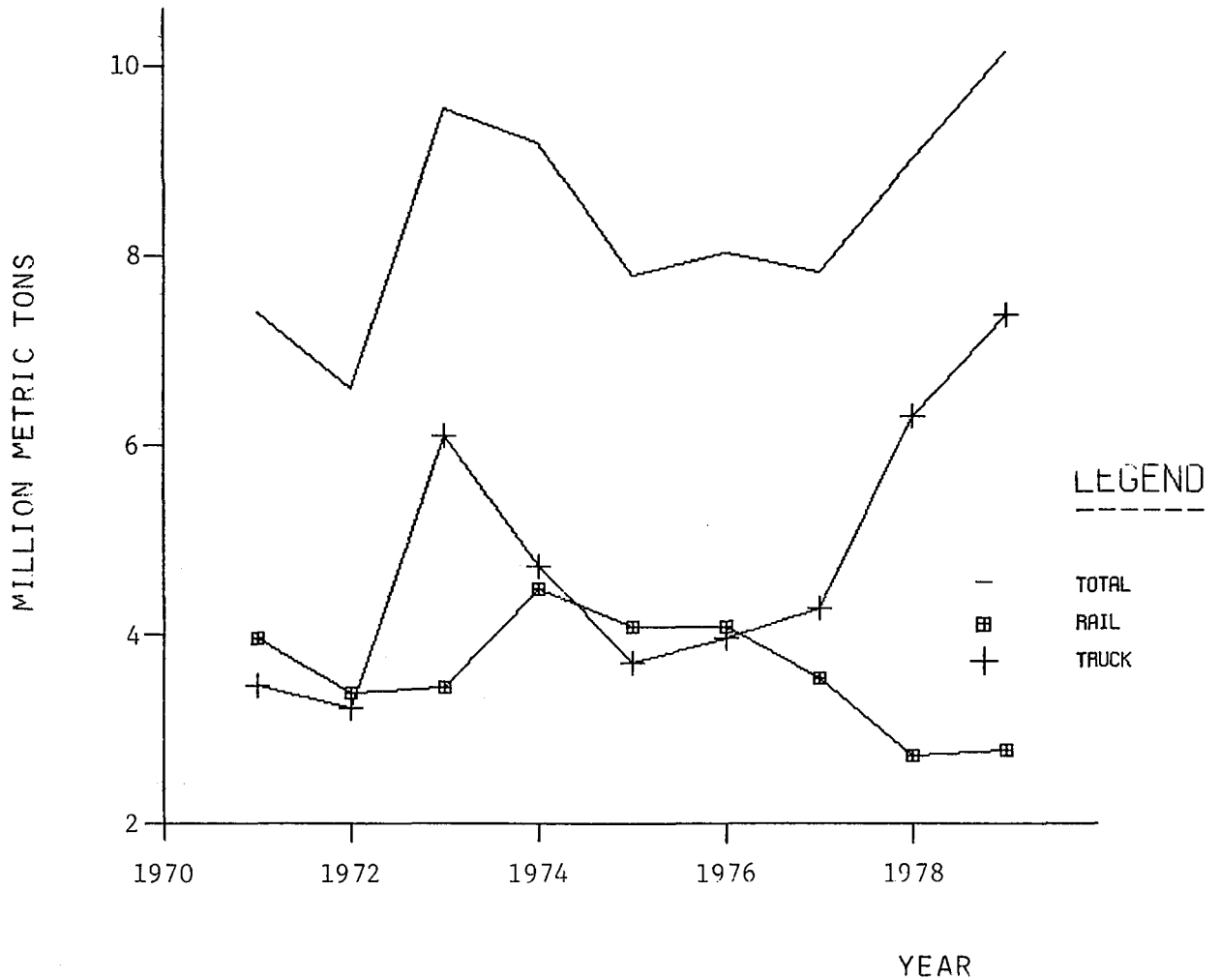
Although railroads lost ground to trucks in hauling grain to the Twin Cities and Duluth/Superior in the 70's, railroads continue to be the predominant mode for certain grains moving into these two markets. This is due to factors such as the length of the shipment, transit privileges and favorable proportional rates to markets in the east. Railroads continue to have a rate advantage over trucks for most grain originating in Montana and the Dakotas.

Shipments to the Twin Cities will be presented first followed by shipments to Duluth/Superior. The source of data for all figures presented in this section is the Minneapolis Grain Exchange Annual Report(s), 1970-79.

¹ Michaels, Gregory H., Richard Levins and Jerry Fruin, Rail and Truck Rates Under Public Regulation: Corn and Soybean Transportation In Minnesota, 1970-1979, Staff Paper Series P81-6, Department of Agricultural and Applied Economics, University of Minnesota.

FIGURE 1

TWIN CITIES RECEIPTS (1970-1979)
ALL COMMODITIES



TWIN CITIES

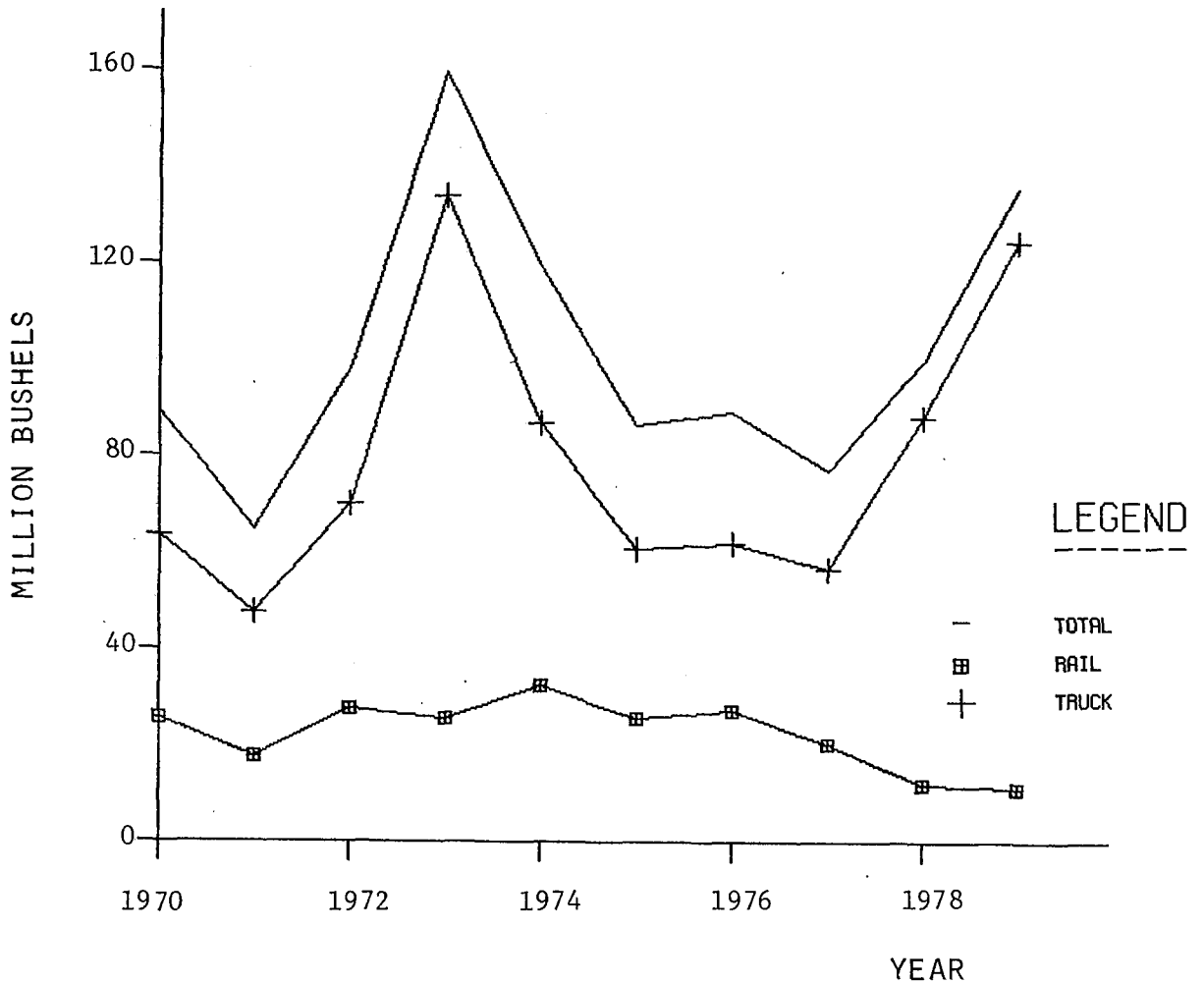
All Commodities - Figure 1

The volume of grain received in the Twin Cities fluctuated considerably in the 70's, ranging from 6.6 million metric tons in 1972 to 10.2 million metric tons in 1979. Most notable in Figure 1 is the tremendous increase in truck shipments in years when grain demand was high (1973, 1974, 1978, and 1979). Trucks accounted for 56 percent of the 84 million metric tons received over the ten years. The volume shipped by railroads, which accounted for the majority of shipments in 1971, peaked in 1974 and steadily declined thereafter, accounting for only 27 percent of the grain volume received in 1979.

FIGURE 2

TWIN CITIES RECEIPTS (1970-1979)

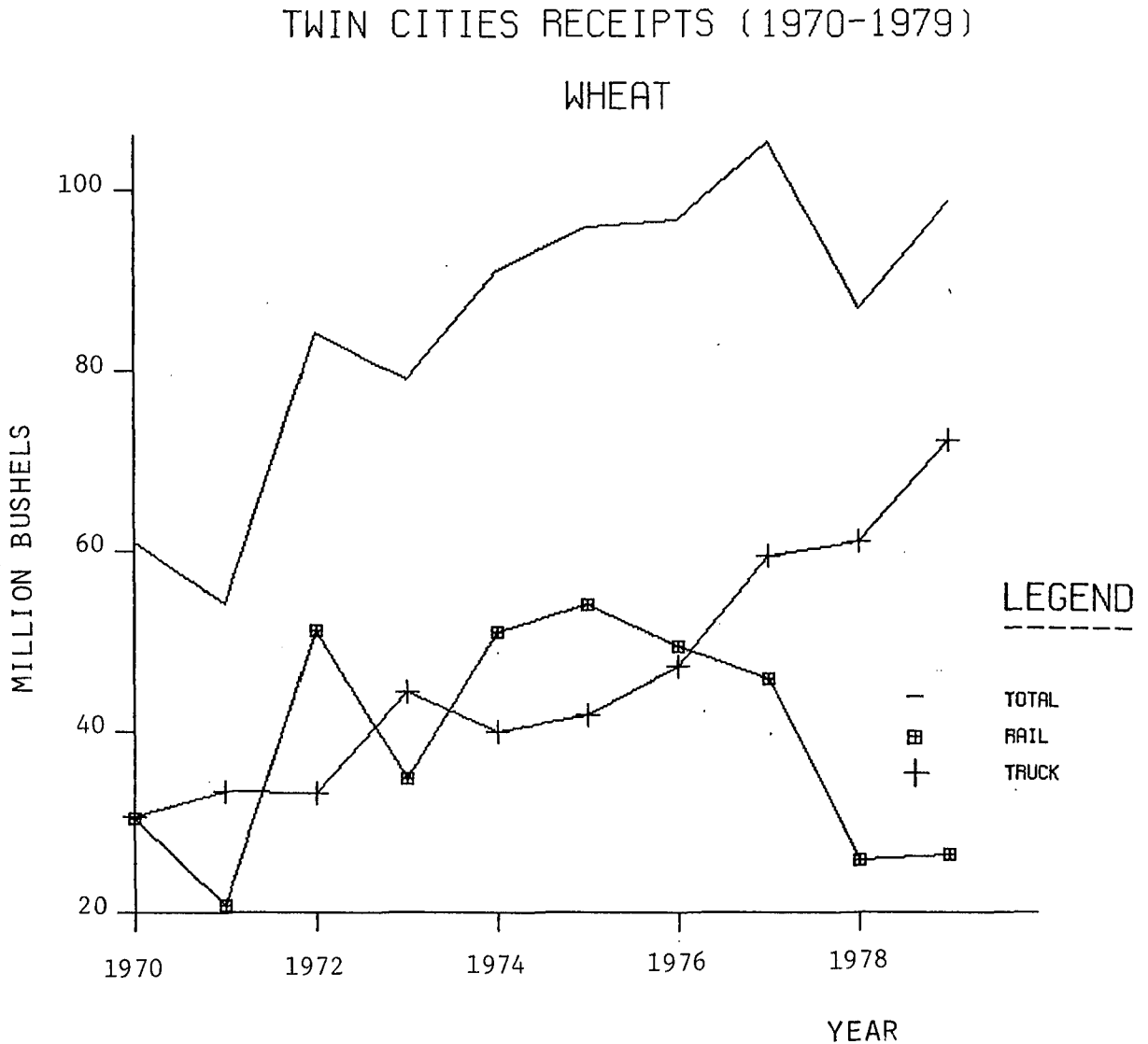
CORN



Corn - Figure 2

Over one billion bushels of corn were received in the Twin Cities in the 70's. Receipts were greatest in 1973, reaching 160 million bushels. The relative and absolute volume carried by trucks tended to be greatest in years when total receipts were greatest. Trucks accounted for 78 percent of the receipts in the decade. The volume shipped by railroads was relatively steady but declining during the second half of the decade, down to 11 million bushels in 1979 from 32 million bushels in 1974. Volumes received by truck ranged from 48 million bushels (1971) to 134 million bushels (1973).

FIGURE 3

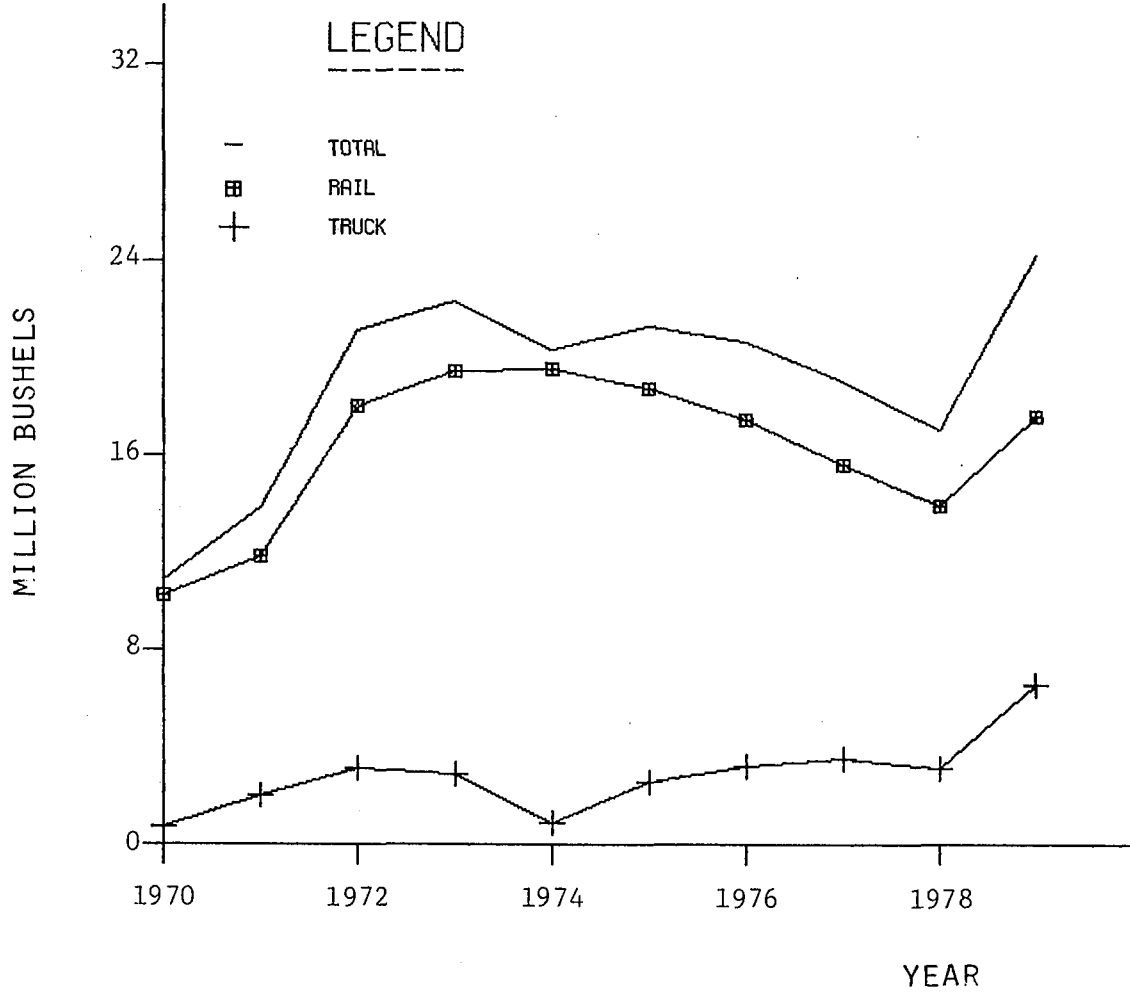


Wheat - Figure 3

Wheat receipts (durum not included) in the Twin Cities increased steadily throughout the 70's from 61 million bushels in 1970 to 99 million bushels in 1979. Receipts peaked in 1977 at 105 million bushels. Truck shipments accounted for the steady increase in volume from 31 million bushels in 1970 to 72 million bushels in 1979. Trucks accounted for roughly 54 percent of the 853 million bushels received in the ten-year period. Railroads, which were the predominant mode in four years (1972, 1974, 1975, and 1976), only accounted for 27 percent of the wheat received in 1979.

FIGURE 4

TWIN CITIES RECEIPTS (1970-1979)
DURUM



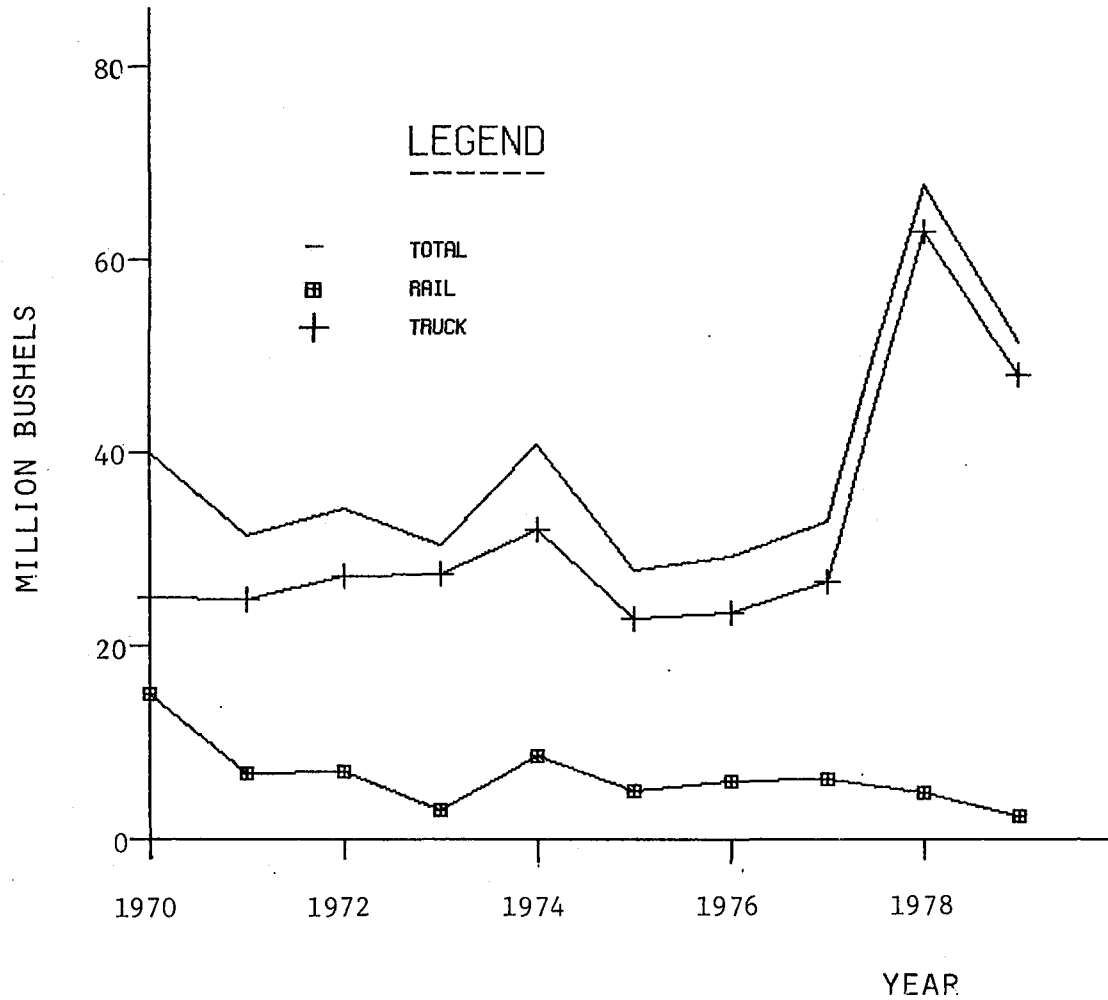
Durum - Figure 4

Durum receipts in the Twin Cities were relatively stable in the 70's, peaking in 1979 at 24 million bushels. Rails dominate durum receipts, accounting for 85 percent of the 191 million bushels received in the decade. Total receipts ranged from 11 million bushels in 1970 to 24 million bushels in 1979.

FIGURE 5

TWIN CITIES RECEIPTS (1970-1979)

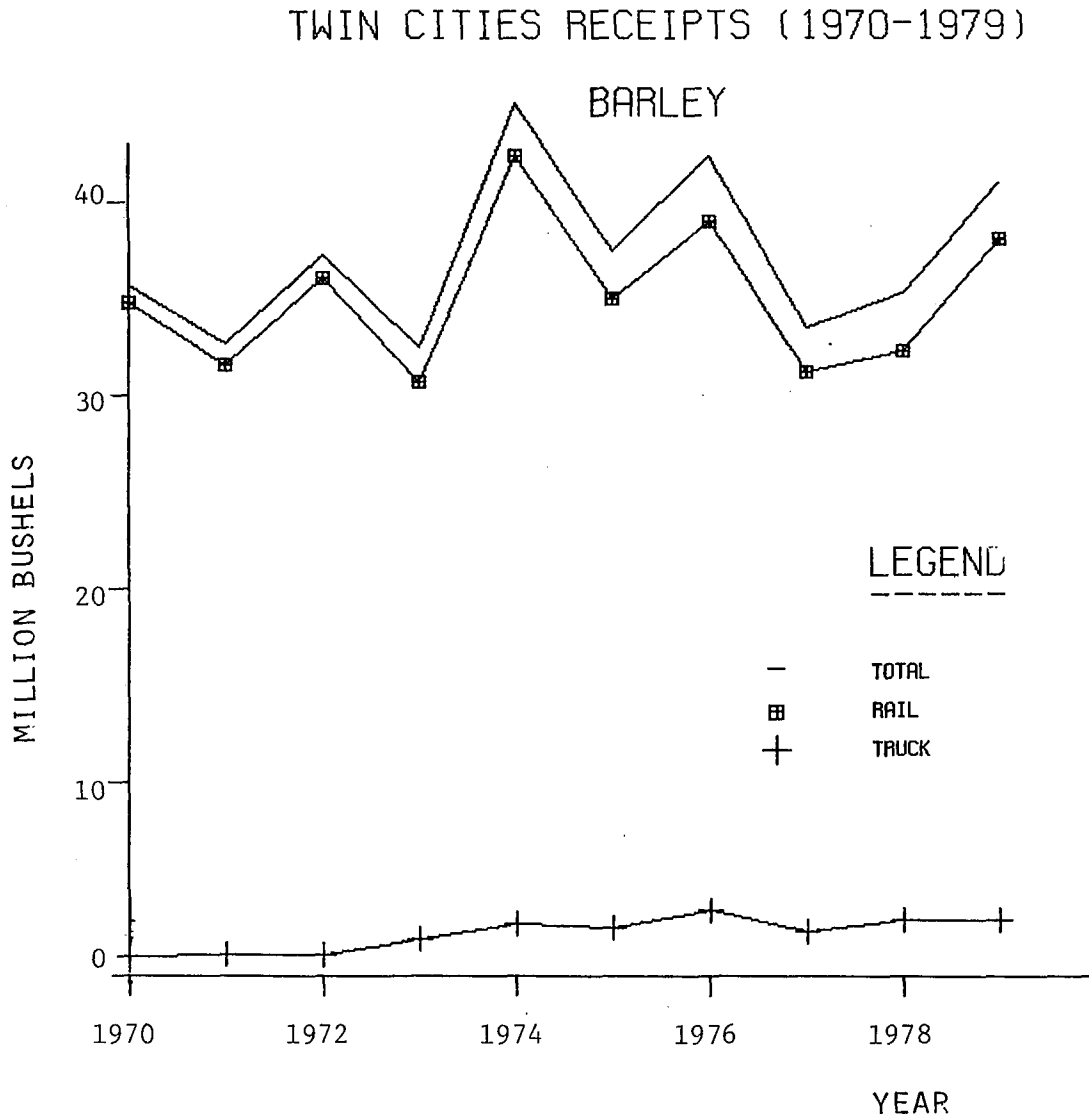
SOYBEANS



Soybeans - Figure 5

Soybean receipts, which were relatively stable through 1977, increased dramatically in 1978 and 1979 in response to consecutive record harvests and increased export demand in 1978 and 1979. Trucks accounted for 83 percent of the 386 million bushels received in the decade. In 1978, receipts peaked at 68 million bushels.

FIGURE 6



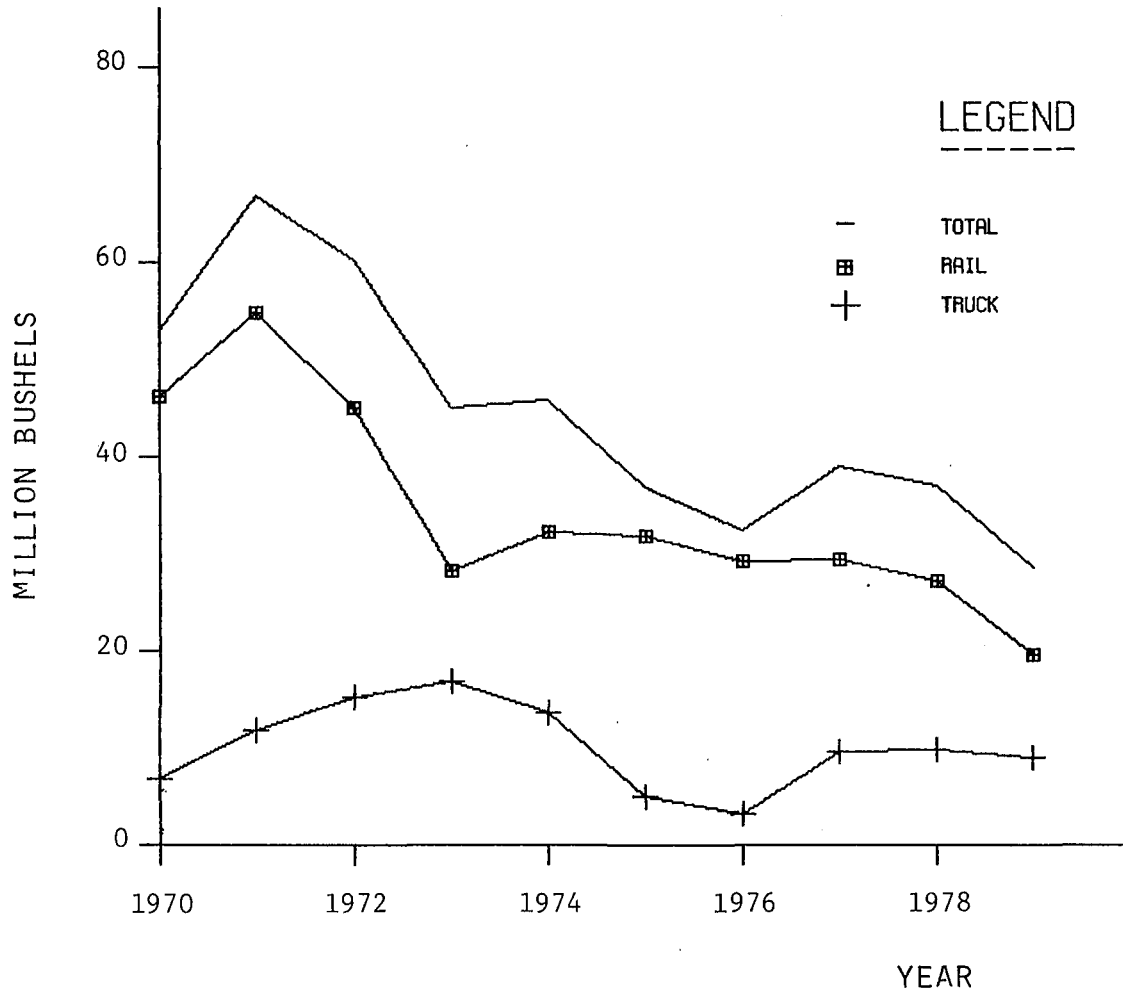
Barley - Figure 6

Barley receipts were relatively stable in the ten-year period, peaking in 1974 at 45 million bushels. Railroads were the predominant mode of transportation, accounting for 94 percent of the 373 million bushels (primarily malting varieties) received in the decade. Rail is the preferred mode for much of the malting barley because of the transit privilege.

FIGURE 7

TWIN CITIES RECEIPTS (1970-1979)

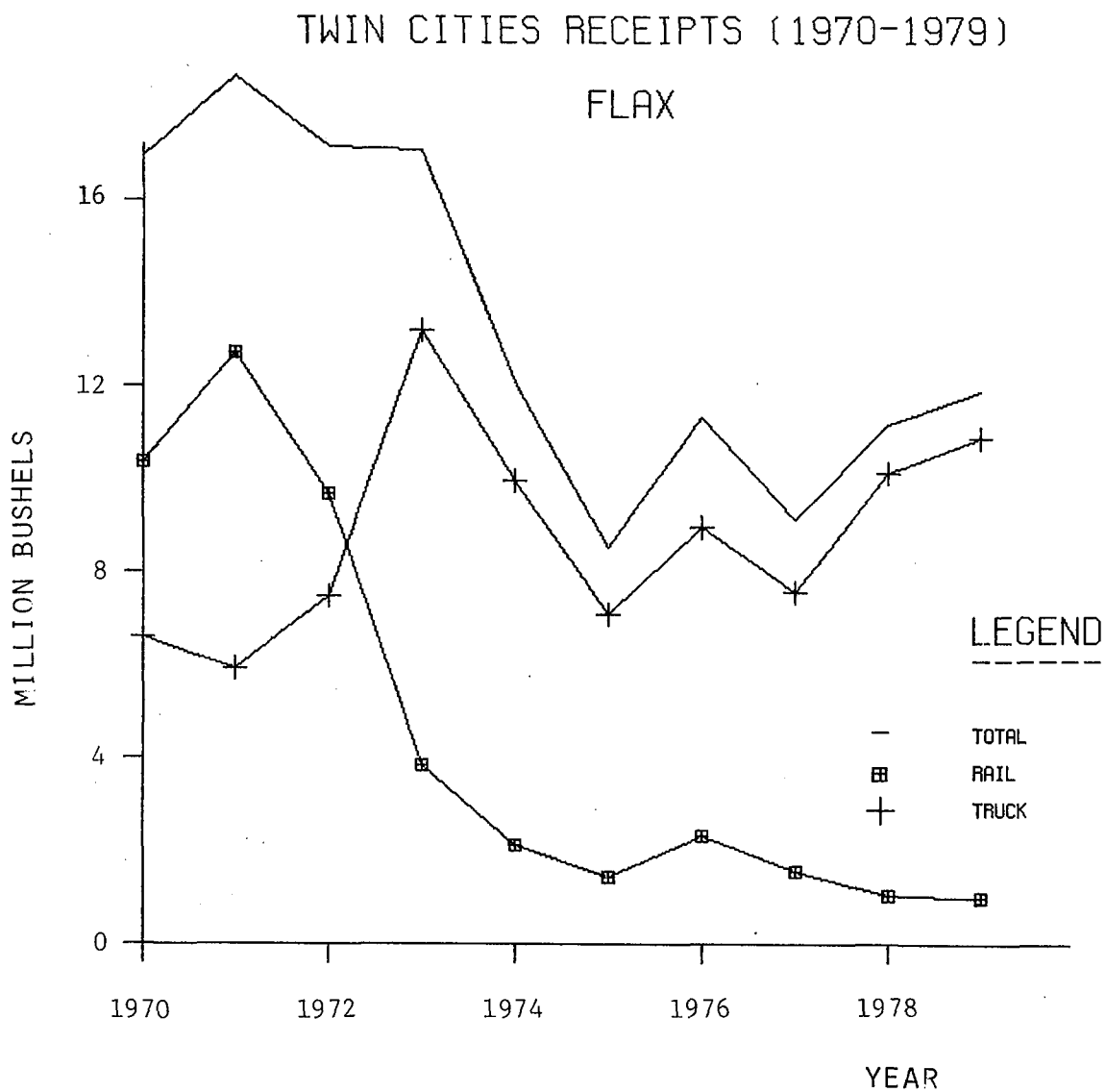
OATS



Oats - Figure 7

Oat receipts in the Twin Cities declined steadily from a high of 67 million bushels in 1971 to a low of 29 million bushels in 1979. Railroads were the predominant mode of transportation, accounting for 77 percent of the 445 million bushels received in the decade. Rail is frequently preferred to truck for oats because of the proportional rail rates available to the major oat consuming regions of the U.S.

FIGURE 8



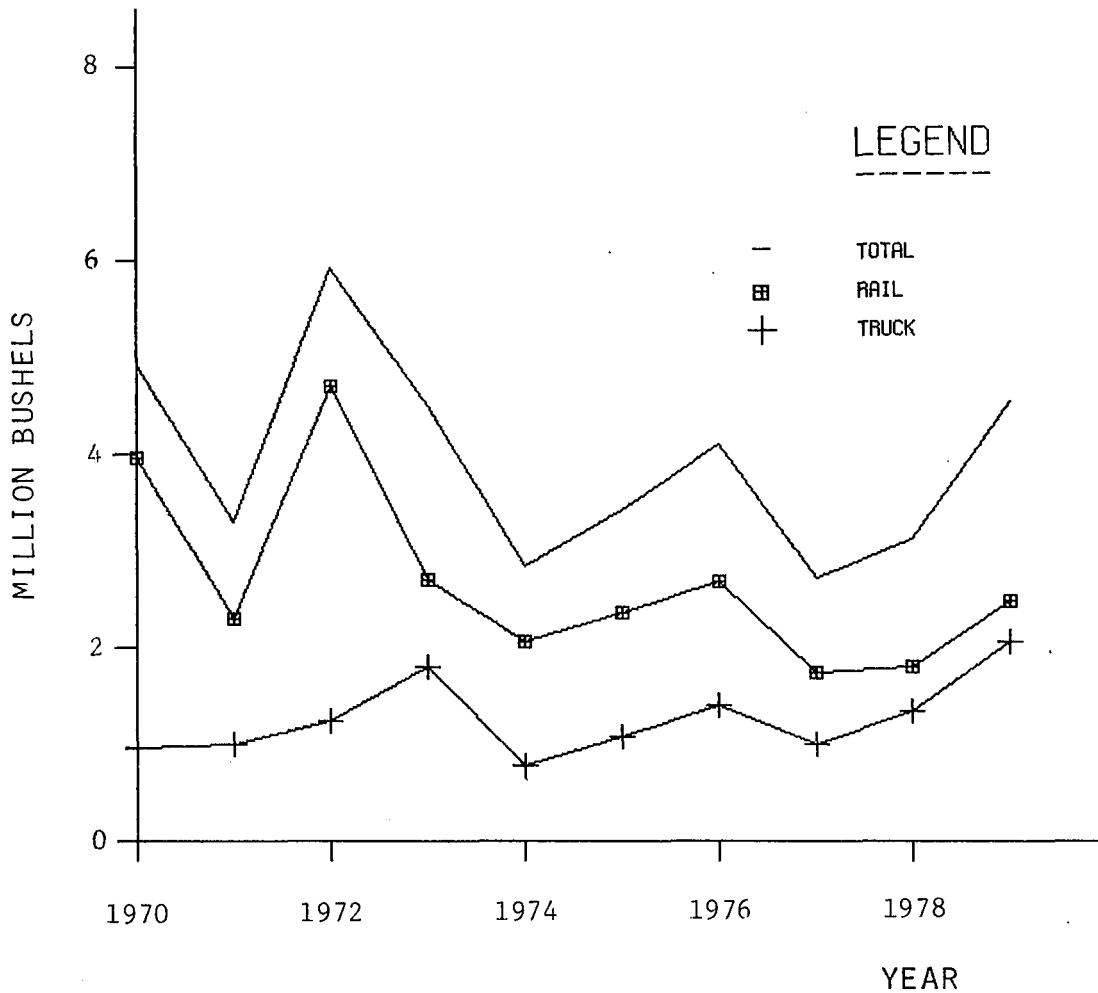
Flax - Figure 8

Flax receipts in the Twin Cities declined during the decade from a high of 18.6 million bushels in 1971 to below 12 million bushels in 1975 and thereafter. Trucks accounted for 65 percent of the 134 million bushels received in the decade. Railroads, which were the predominant carrier prior to 1973, accounted for only 8 percent of the shipments in 1979.

FIGURE 9

TWIN CITIES RECEIPTS (1970-1979)

RYE



Rye - Figure 9

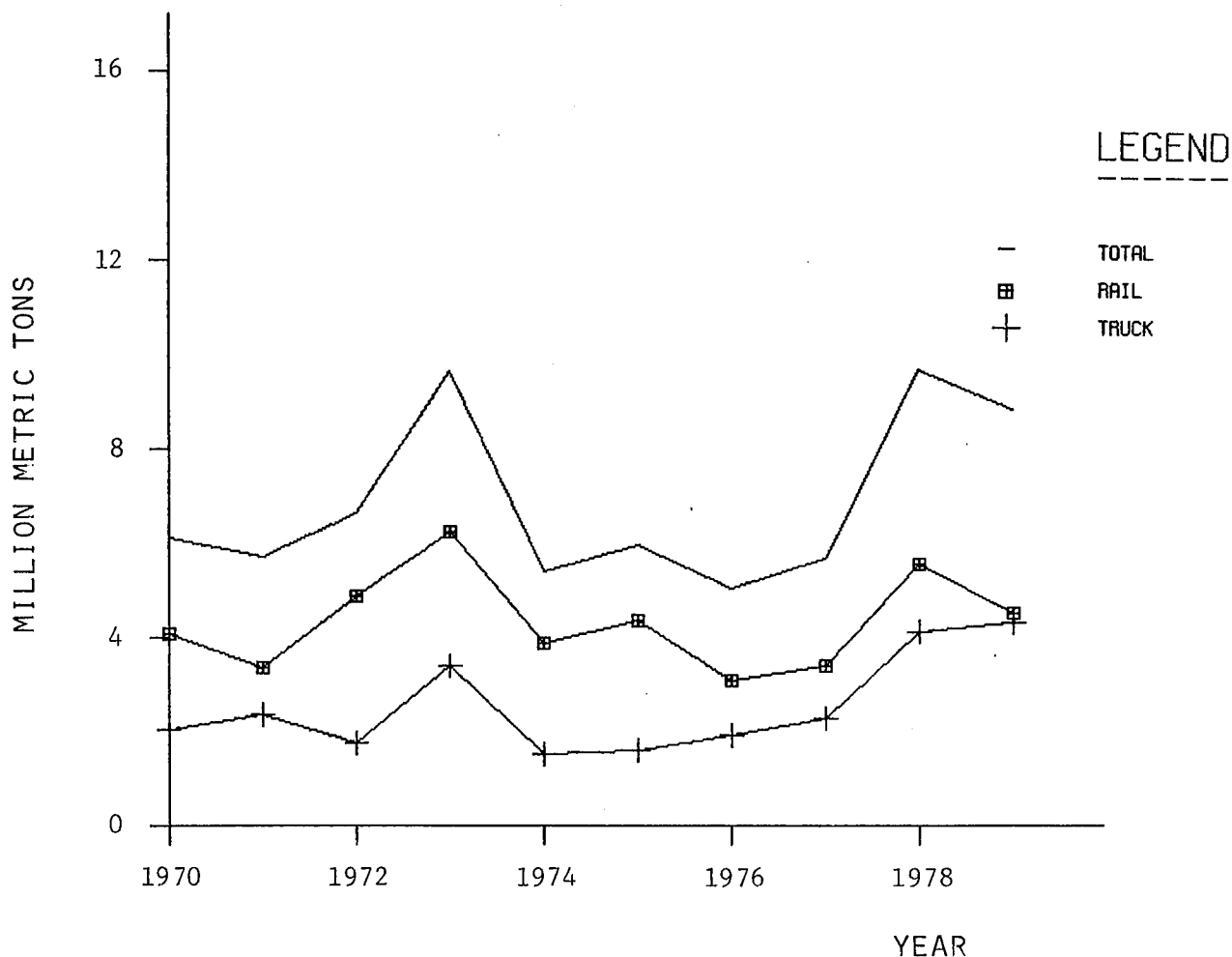
Rye receipts were relatively stable, peaking in 1972 (5.9 million bushels). Railroads were the predominant mode of transportation in all ten years, accounting for 68 percent of the 39 million bushels received. Trucks accounted for 45 percent of the volume received in 1979.

Sunflowers

Sunflowers are relatively new to the Twin Cities market. Terminal elevator and processor receipts were 165,000 and 254,000 metric tons in 1978 and 1979, respectively. No reliable data is available prior to 1978. Trucks accounted for over 80 percent of the receipts in both years.

FIGURE 10

DULUTH-SUPERIOR RECEIPTS (1970-1979)
ALL COMMODITIES



DULUTH/SUPERIOR

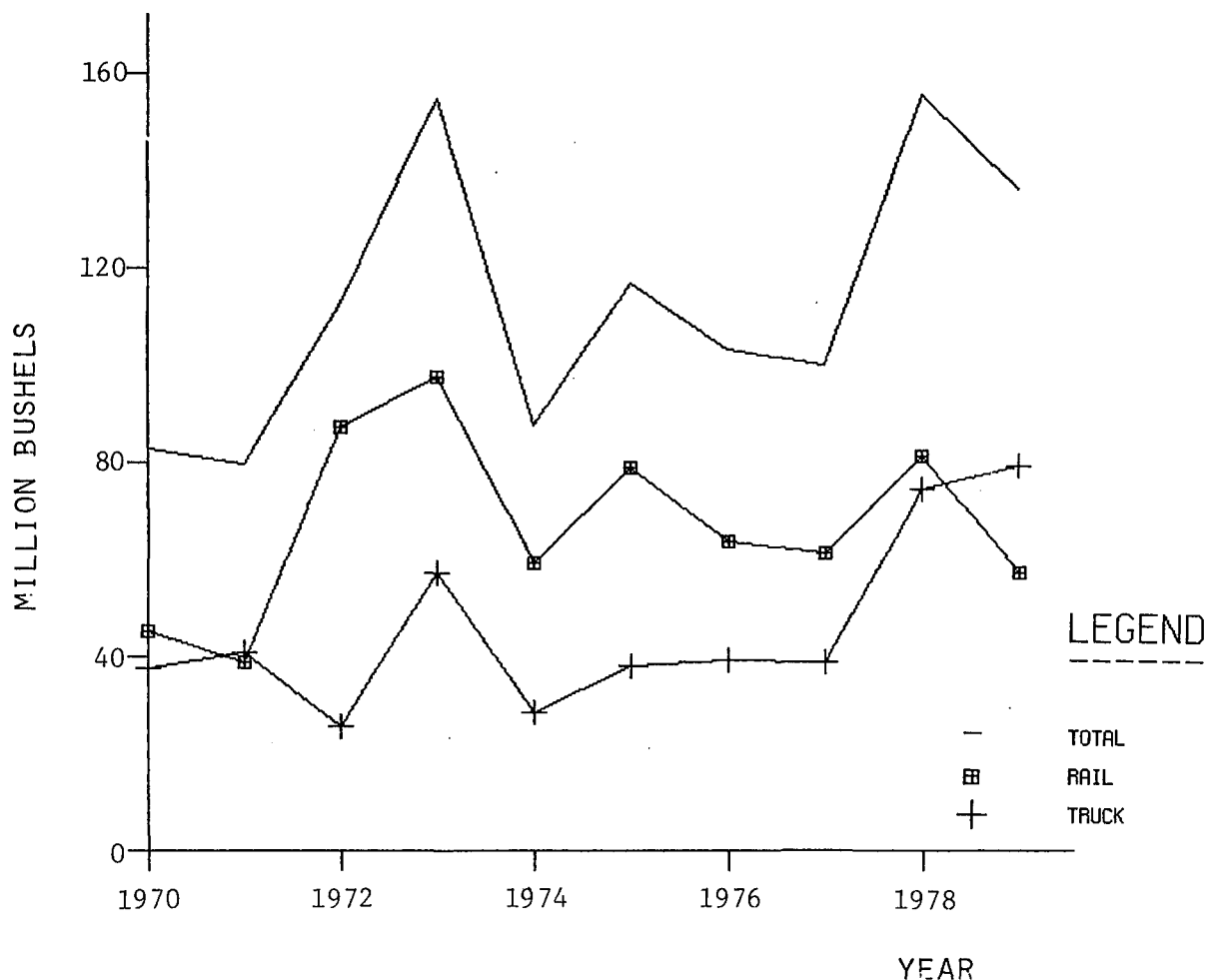
All Commodities - Figure 10

Roughly 69 million metric tons of grain (equivalent to 2.5 billion bushels of wheat) were received in Duluth/Superior in the 70's. Grain receipts were a record 9.68 million metric tons in 1978, surpassing the previous high of 9.67 million metric tons in 1973. Railroads were the predominant carrier in all ten years, accounting for 63 percent of the volume received. The volume received by trucks increased to 49 percent of total receipts in 1979.

FIGURE 11

DULUTH-SUPERIOR RECEIPTS (1970-1979)

WHEAT



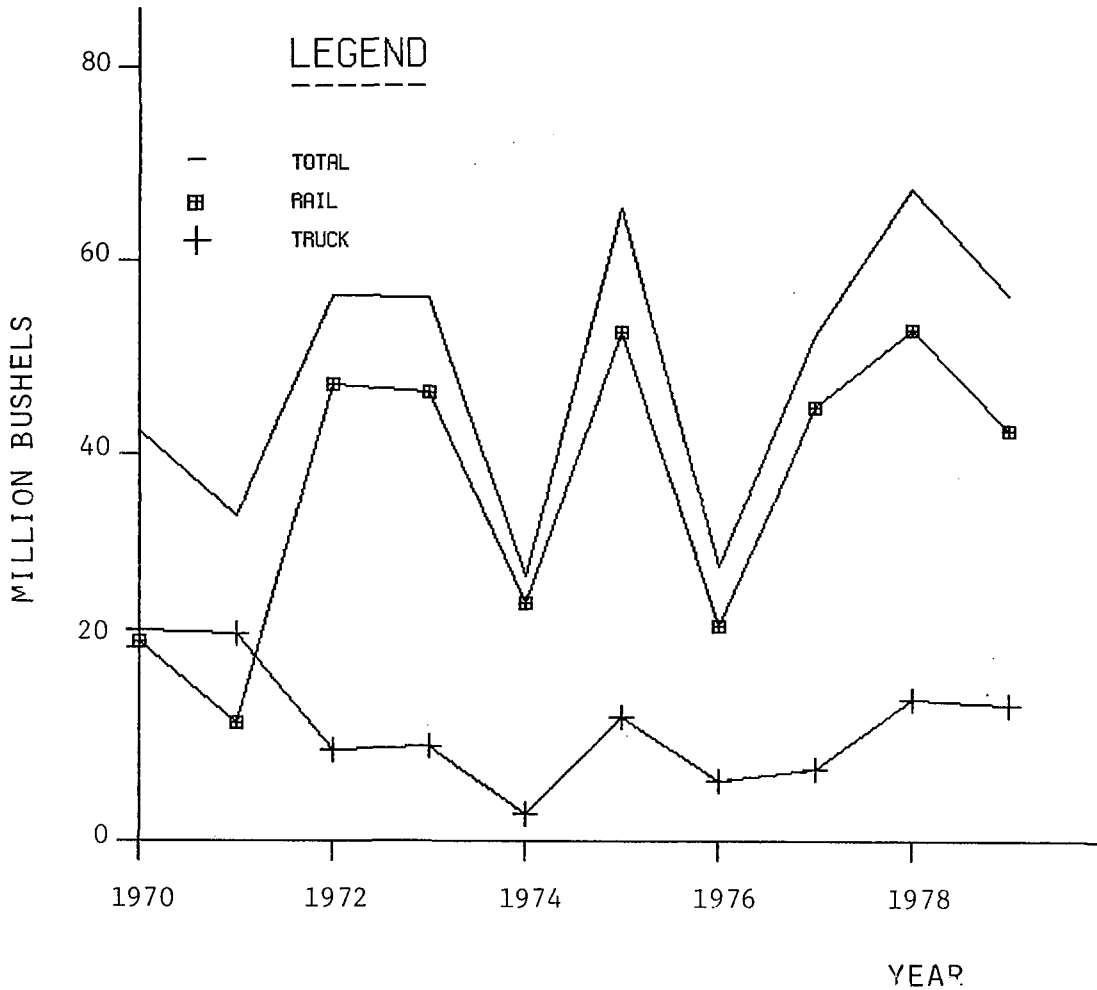
Wheat - Figure 11

The volume of wheat (durum not included) received in Duluth/Superior fluctuated from 80 million bushels in 1971 to 156 million bushels in 1978. Railroads were the predominant carrier in eight of the ten years, accounting for 59 percent of the 1.12 billion bushels received in the decade. Trucks accounted for 58 percent of the volume received in 1979.

FIGURE 12

DULUTH-SUPERIOR RECEIPTS (1970-1979)

DURUM



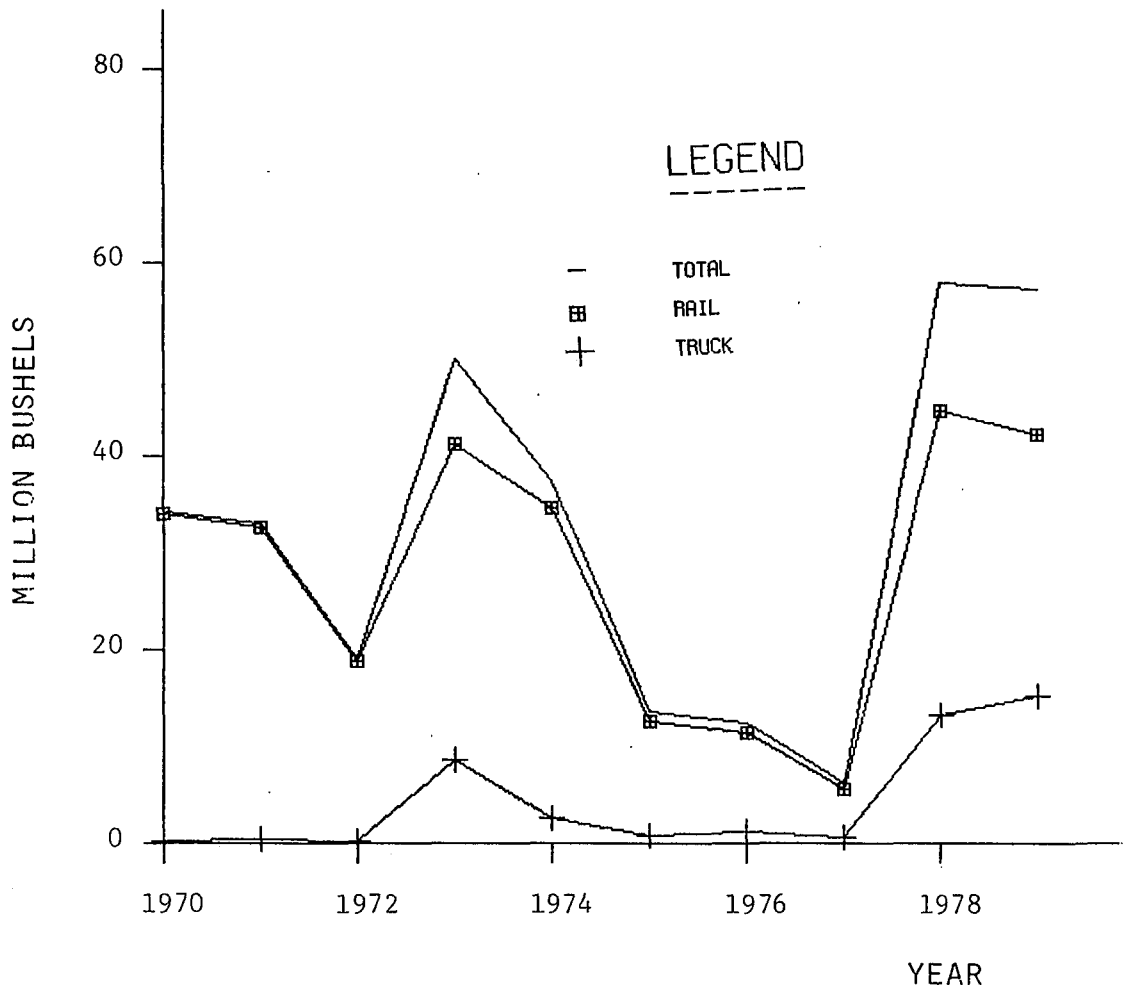
Durum - Figure 12

Durum receipts in Duluth/Superior fluctuated considerably from a low of 27 million bushels in 1974 to 67 million bushels in 1978. Railroads accounted for 75 percent of the 486 million bushels received in the decade. Trucks were the major carrier in 1970 and 1971, prior to a significant rail rate reduction, accounting for 51 percent and 64 percent of receipts, respectively.

FIGURE 13

DULUTH-SUPERIOR RECEIPTS (1970-1979)

CORN



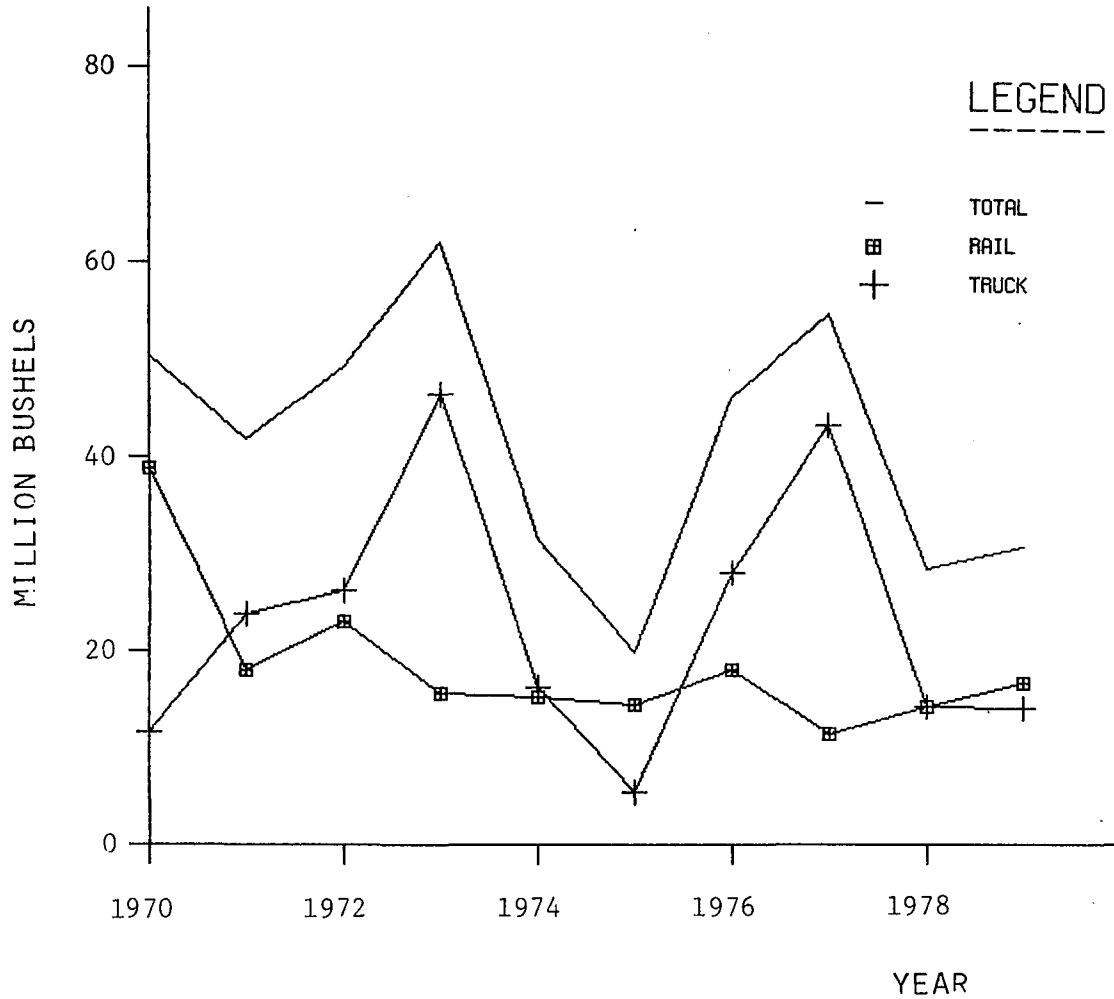
Corn - Figure 13

Corn receipts in Duluth/Superior reached historic highs in 1978 (58 million bushels) and 1979 (57 million bushels). Railroads were the major carrier in all years, accounting for 87 percent of the 324 million bushels received during the period. Only six million bushels were received in 1977, following the drought years of 1975 and 1976.

FIGURE 14

DULUTH-SUPERIOR RECEIPTS (1970-1979)

BARLEY



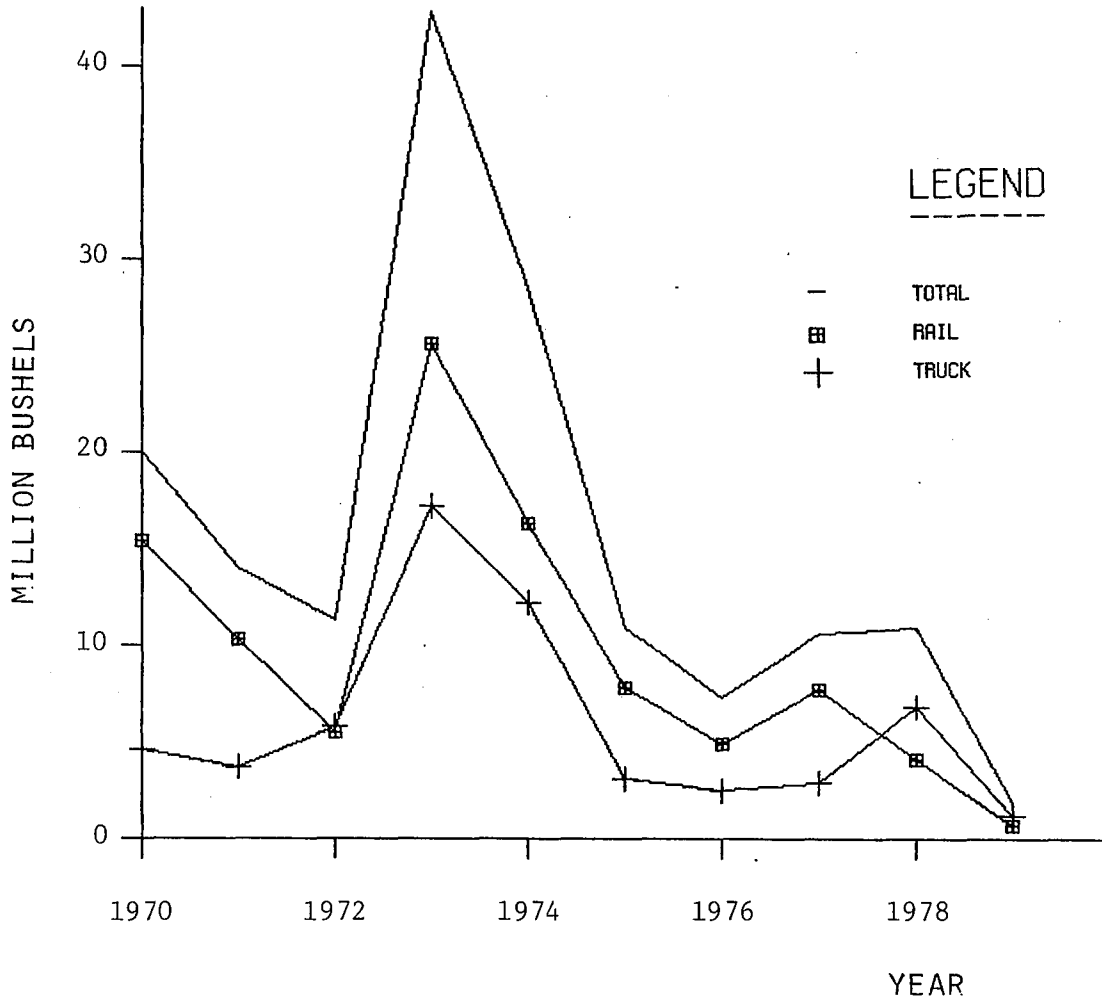
Barley - Figure 14

Barley receipts in Duluth/Superior fluctuated widely from a high of 62 million bushels in 1973 to a low of 20 million bushels in 1975. Trucks' share of receipts was greatest in years when receipts were highest (1973 and 1977). Since much of the barley shipped to Duluth is feed barley, the rail transit privilege is not as important as for shipments to the Twin Cities. The volume of barley received by rail was relatively stable except in 1970 when the railroads accounted for nearly 40 million bushels received (77 percent of total). A total of 414 million bushels were received during the decade.

FIGURE 15

DULUTH-SUPERIOR RECEIPTS (1970-1979)

OATS



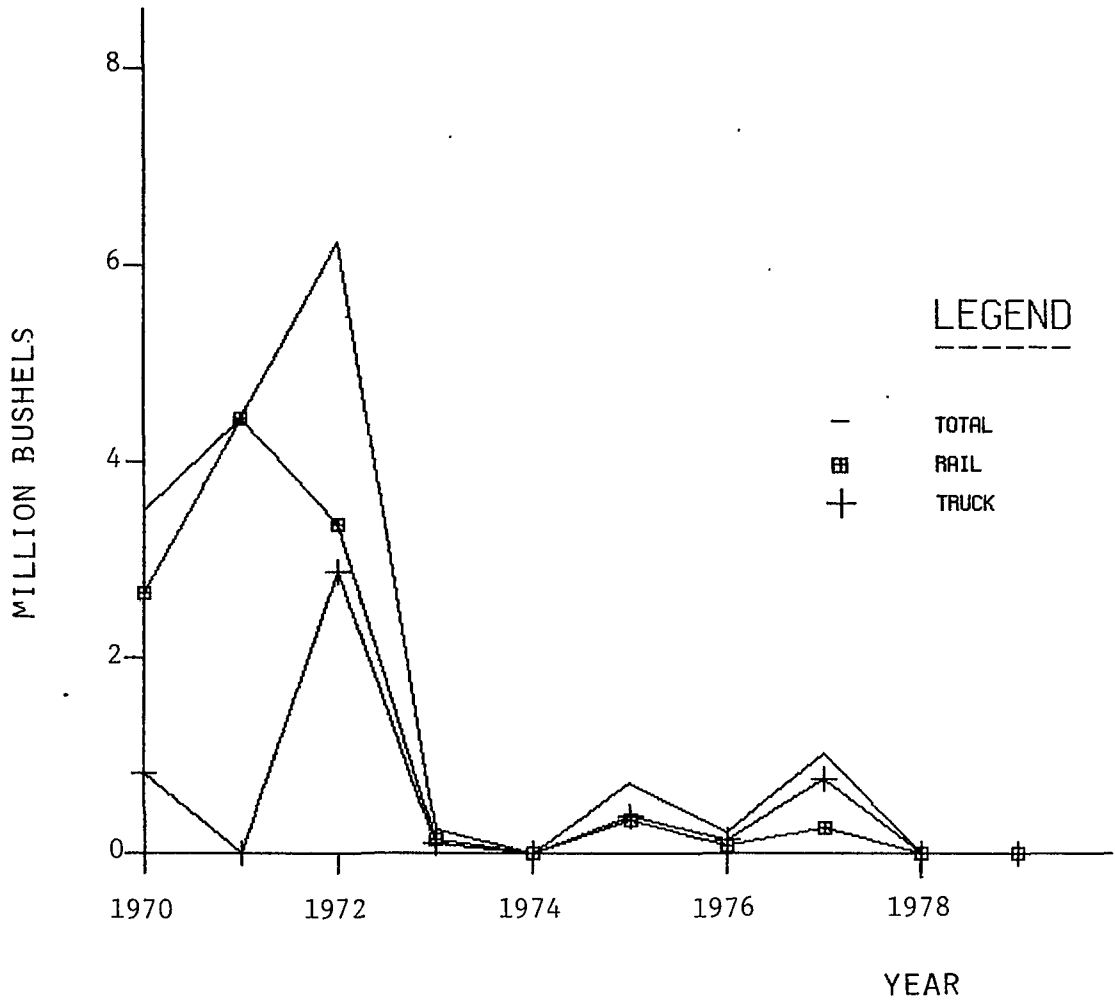
Oats - Figure 15

Oats received in Duluth/Superior ranged from as high as 43 million bushels in 1973 to less than two million bushels in 1979. Over the decade, a total of 158 million bushels were received. Railroads accounted for 62 percent of the shipments.

FIGURE 16

DULUTH-SUPERIOR RECEIPTS (1970-1979)

FLAX



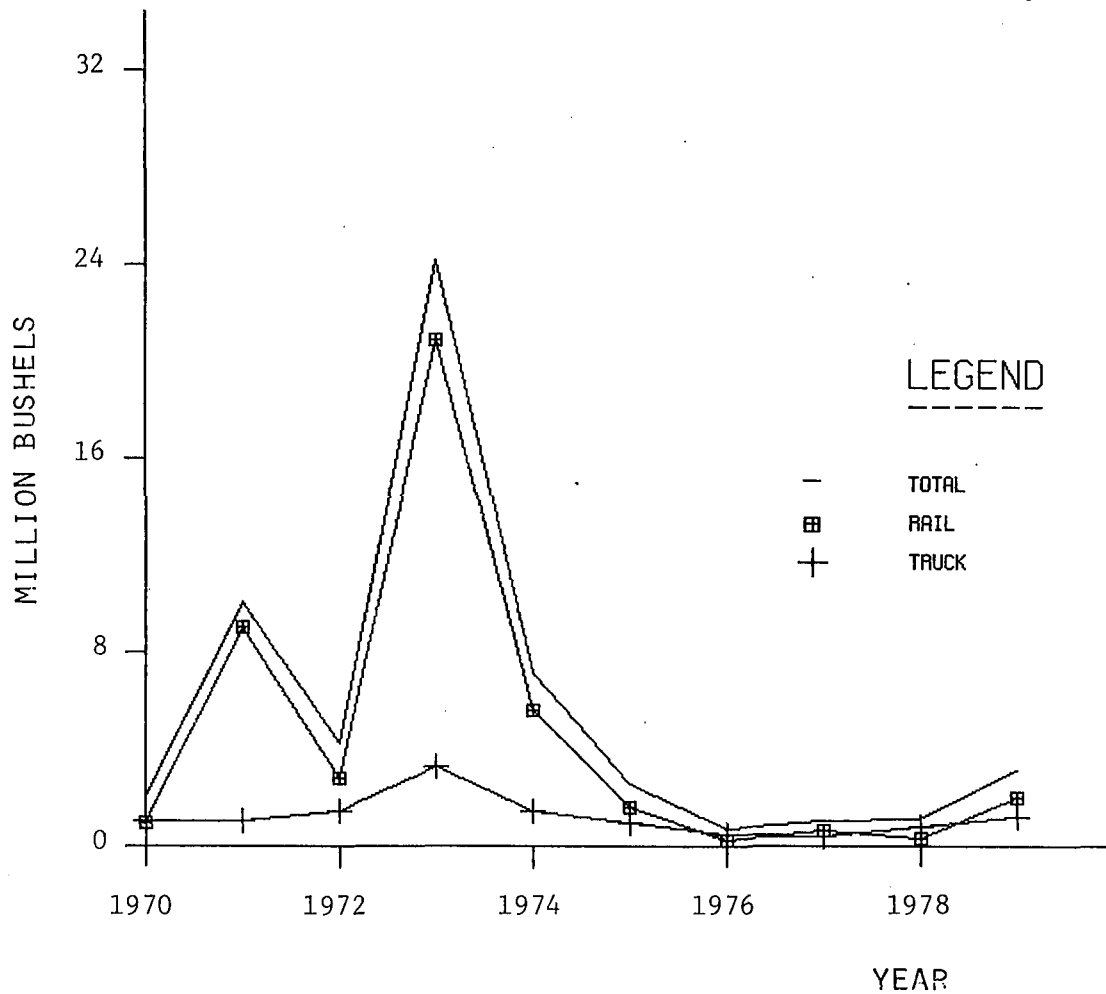
Flax - Figure 16

Flax receipts were relatively insignificant in the 70's. Railroads accounted for 69 percent of the 16 million bushels received in the decade. The majority of the receipts occurred prior to 1973.

FIGURE 17

DULUTH-SUPERIOR RECEIPTS (1970-1979)

RYE



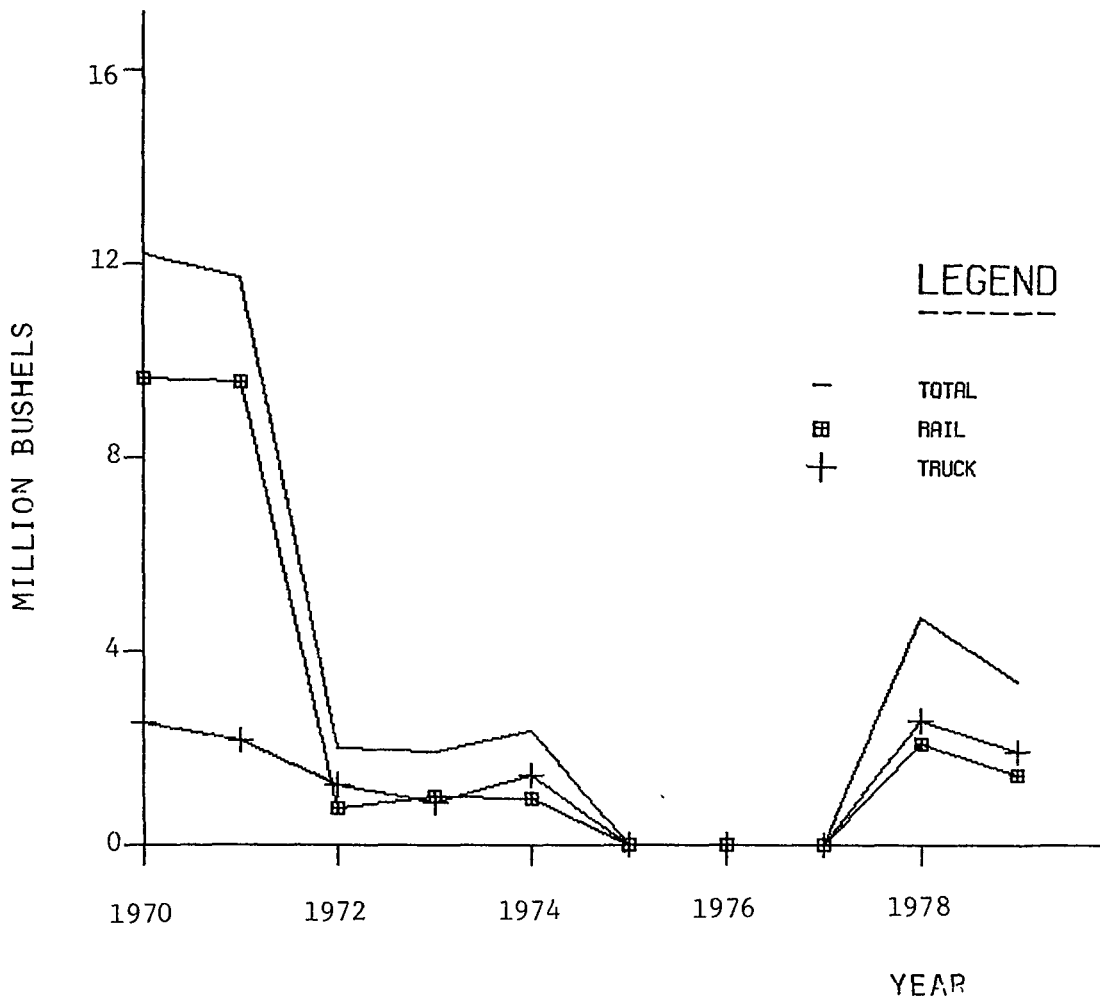
Rye - Figure 17

Duluth/Superior received 56 million bushels of rye in the 70's. Annual receipts ranged from 24 million bushels in 1973 to less than a million bushels in 1976. Railroads accounted for 78 percent of the rye received.

FIGURE 18

DULUTH-SUPERIOR RECEIPTS (1970-1979)

SOYBEANS



Soybeans - Figure 18

Soybean receipts were relatively insignificant in the 70's. Receipts ranged from 12.2 million bushels in 1970 to zero in 1975, 1976, and 1977. Railroads were the predominant mode of transportation when receipts were greatest, accounting for roughly 80 percent of the receipts in 1970 and 1971.

Sunflowers

The large share of sunflowers produced in Minnesota and the Dakotas is marketed in Duluth/Superior. Terminal elevator receipts were 1.16 million and 1.26 million metric tons in 1978 and 1979, respectively. Trucks accounted for 75 percent of the receipts in 1978 and 79 percent in 1979.

SECTION III

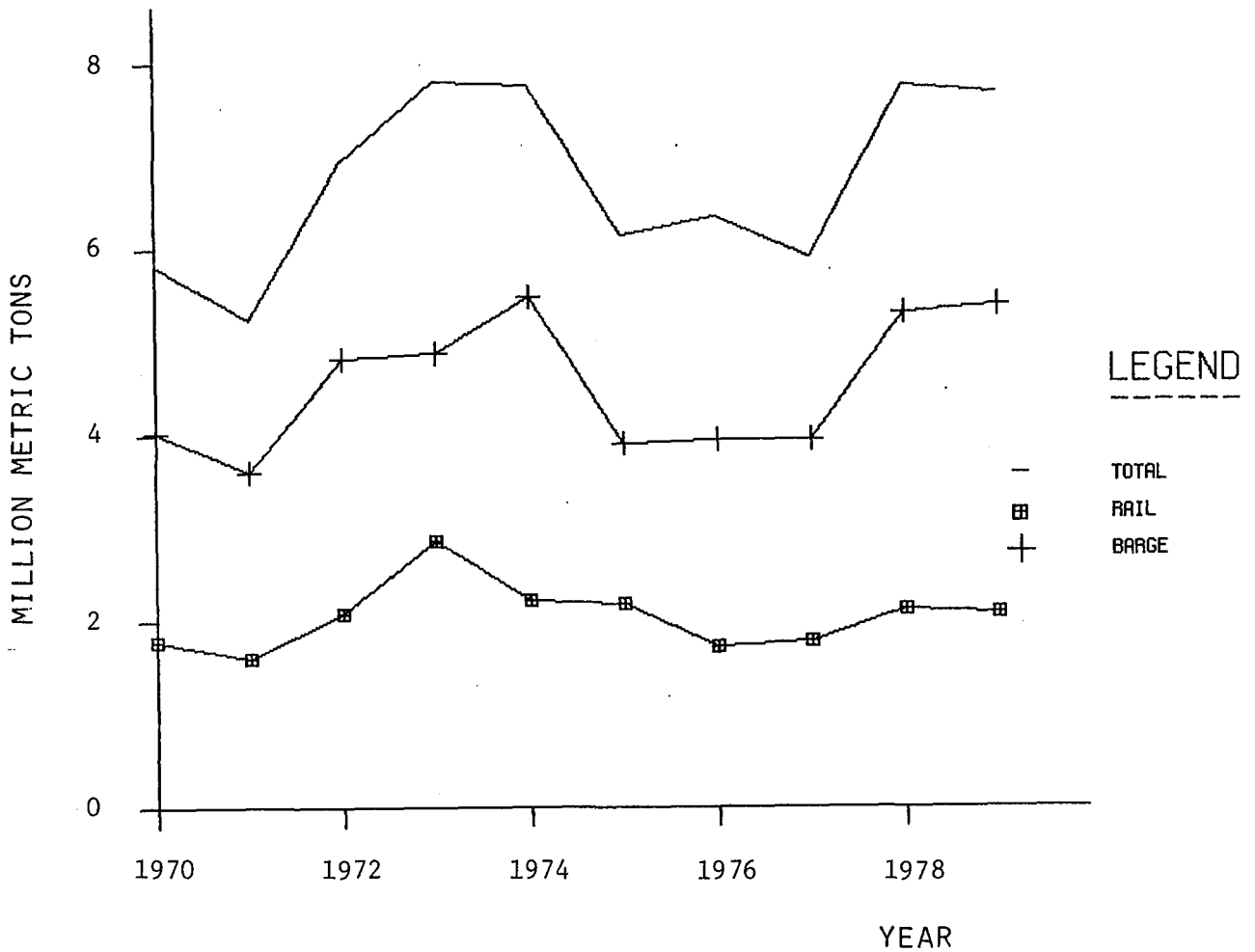
GRAIN SHIPMENTS OUT OF THE TWIN CITIES AND DULUTH/SUPERIOR

Water modes of transportation play an important role in moving Upper Midwest cash grain into export channels. River terminal elevators on the Minnesota and Mississippi Rivers ship large volumes of grain, primarily corn, soybeans, and wheat, via barge, to the Gulf of Mexico for export. Saltwater vessels called "Salties" and smaller lakers carry large volumes of grain, primarily wheat, durum, and sunflowers, either to domestic ports or to foreign countries worldwide. Grain not transported via water modes of transportation is carried by rail either east to grain processors or to deepwater ports at the Gulf of Mexico, and more recently, in the Pacific Northwest.

This section analyzes the movement of grain out of the Twin Cities and Duluth/Superior. Emphasis is placed on the volume of grain shipped from each market and the relative shares carried by railroads, barges and vessels. The source of data for all figures in this section is the Minneapolis Grain Exchange Annual Reports, 1970-79.

FIGURE 19

TWIN CITIES SHIPMENTS (1970-1979)
ALL COMMODITIES



TWIN CITIES

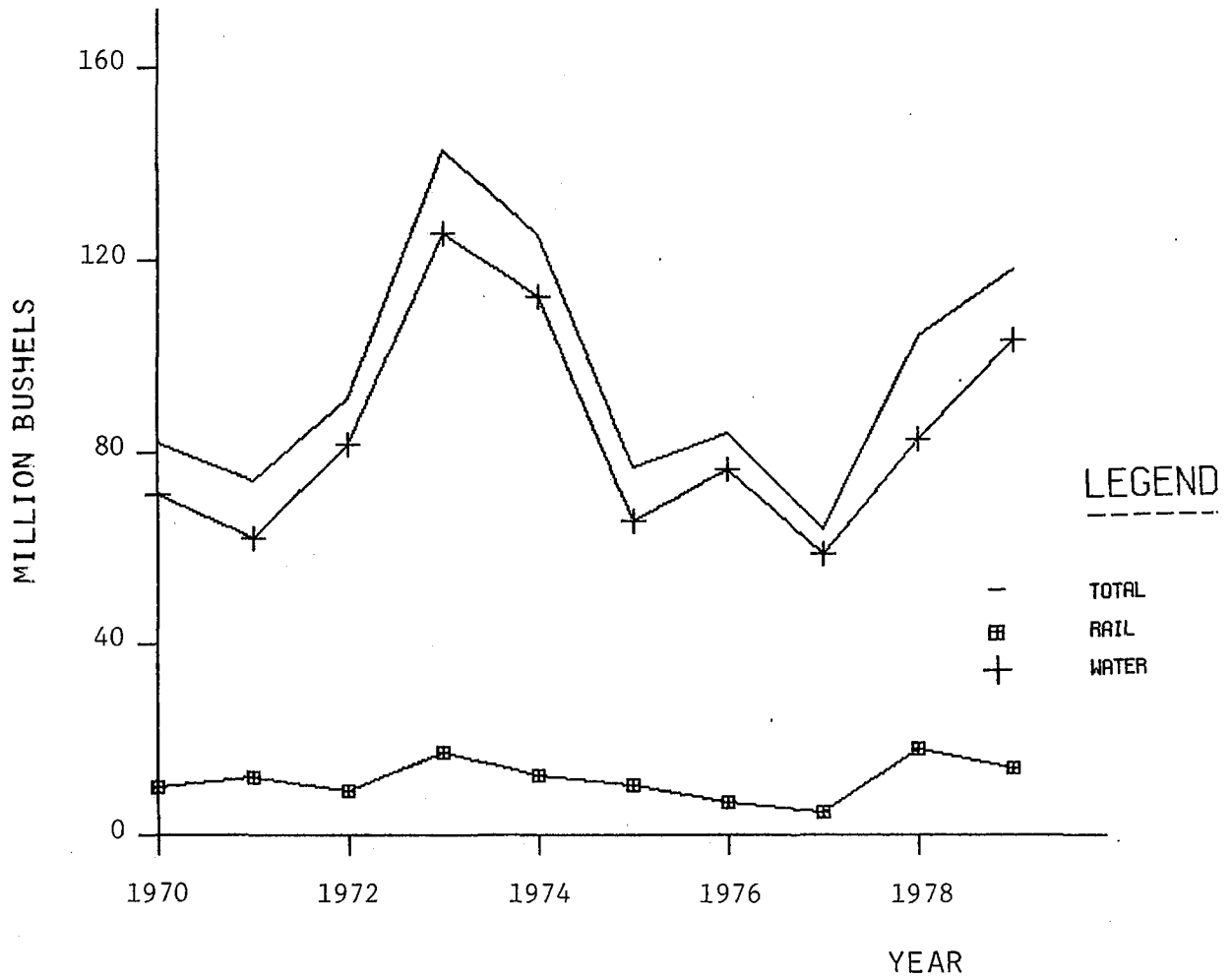
All Commodities - Figure 19

Terminal elevators in the Twin Cities shipped an estimated 67 million metric tons of grain to foreign and domestic markets in the 70's. Shipments per year fluctuated from 5.2 million metric tons in 1971 to 7.8 million metric tons in 1974. Shipments by barge accounted for 68 percent of the total shipments in the ten-year period. The railroad share of total shipments, which remained relatively stable throughout the decade, was 30 percent.

FIGURE 20

TWIN CITIES SHIPMENTS (1970-1979)

CORN



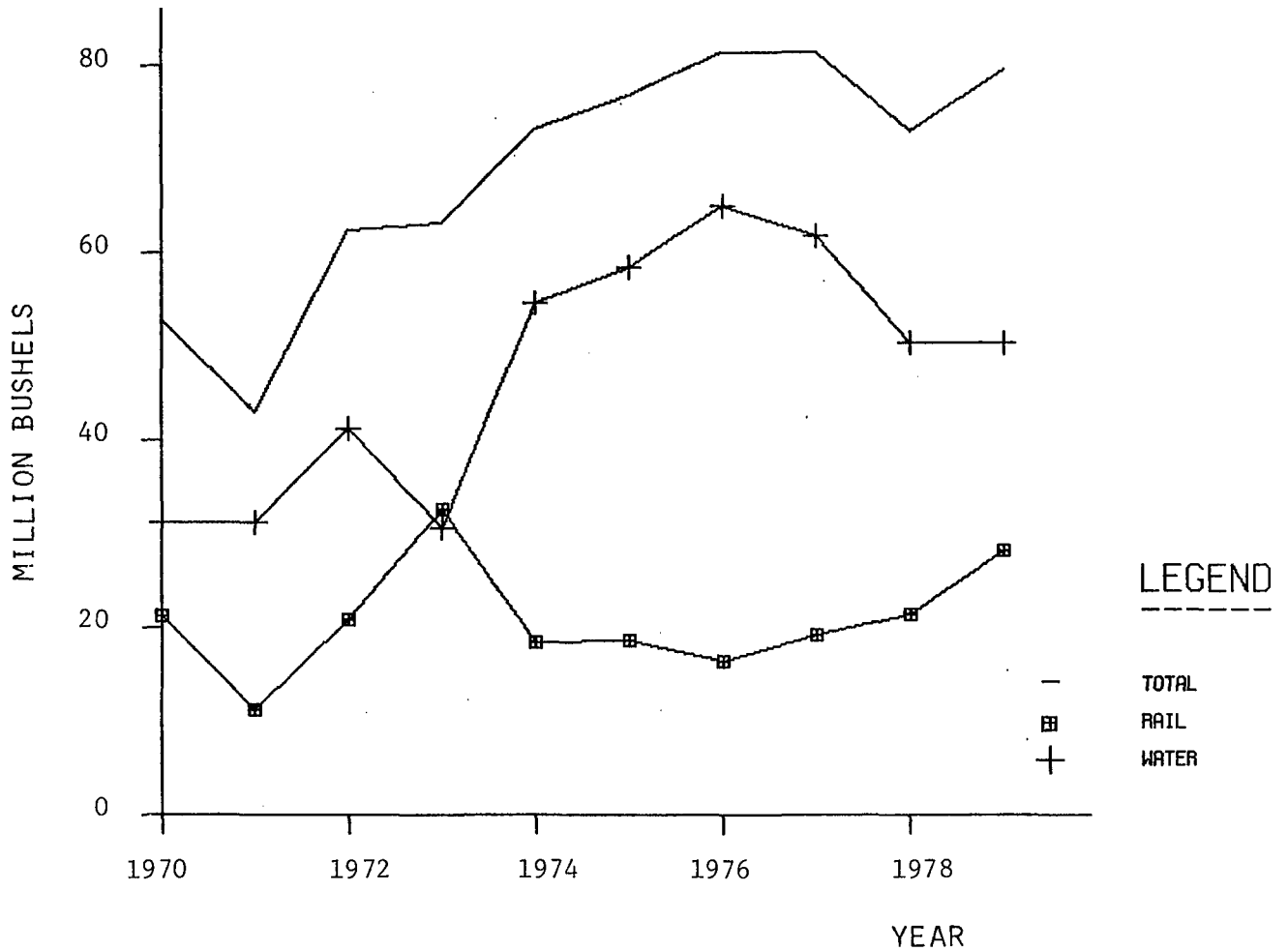
Corn - Figure 20

Barge, which was the predominant mode of transportation in each year, accounted for 87 percent of the 963 million bushels of corn shipped out of the Twin Cities in the decade. Corn shipments were greatest in 1973 (143 million bushels) and 1974 (125 million bushels). Only 64 million bushels were shipped in 1977, a year following a severe drought.

FIGURE 21

TWIN CITIES SHIPMENTS (1970-1979)

WHEAT



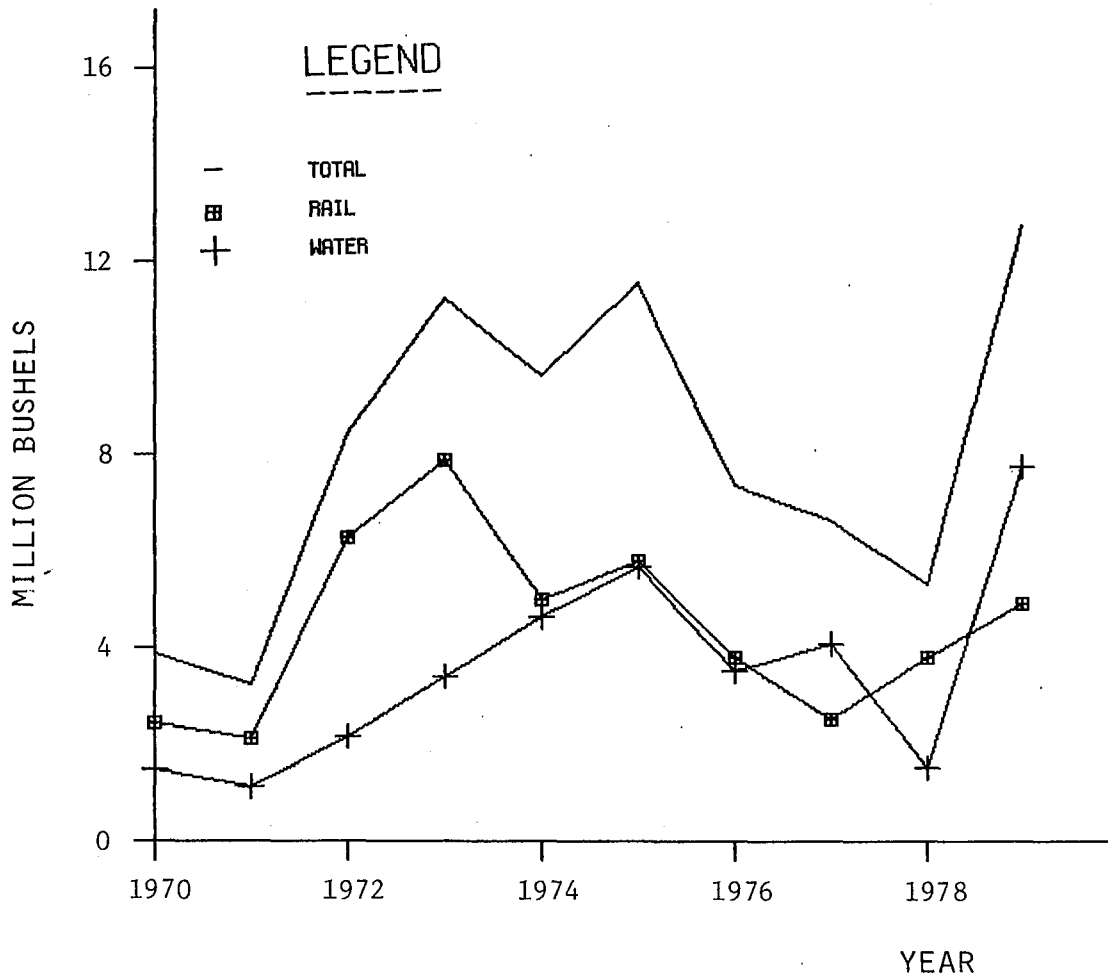
Wheat - Figure 21

Wheat shipments (durum not included) from terminal elevators in the Twin Cities increased steadily during the 70's. Shipments per year ranged from 43 million bushels in 1971 to 81.4 million bushels in 1977. Barge shipments, primarily to the Gulf of Mexico for export, accounted for 69 percent of the 687 million bushels shipped during the decade. Shipments by rail, primarily east for processing, accounted for 30 percent of total shipments. Rail was the predominant mode of transportation in 1973.

FIGURE 22

TWIN CITIES SHIPMENTS (1970-1979)

DURUM

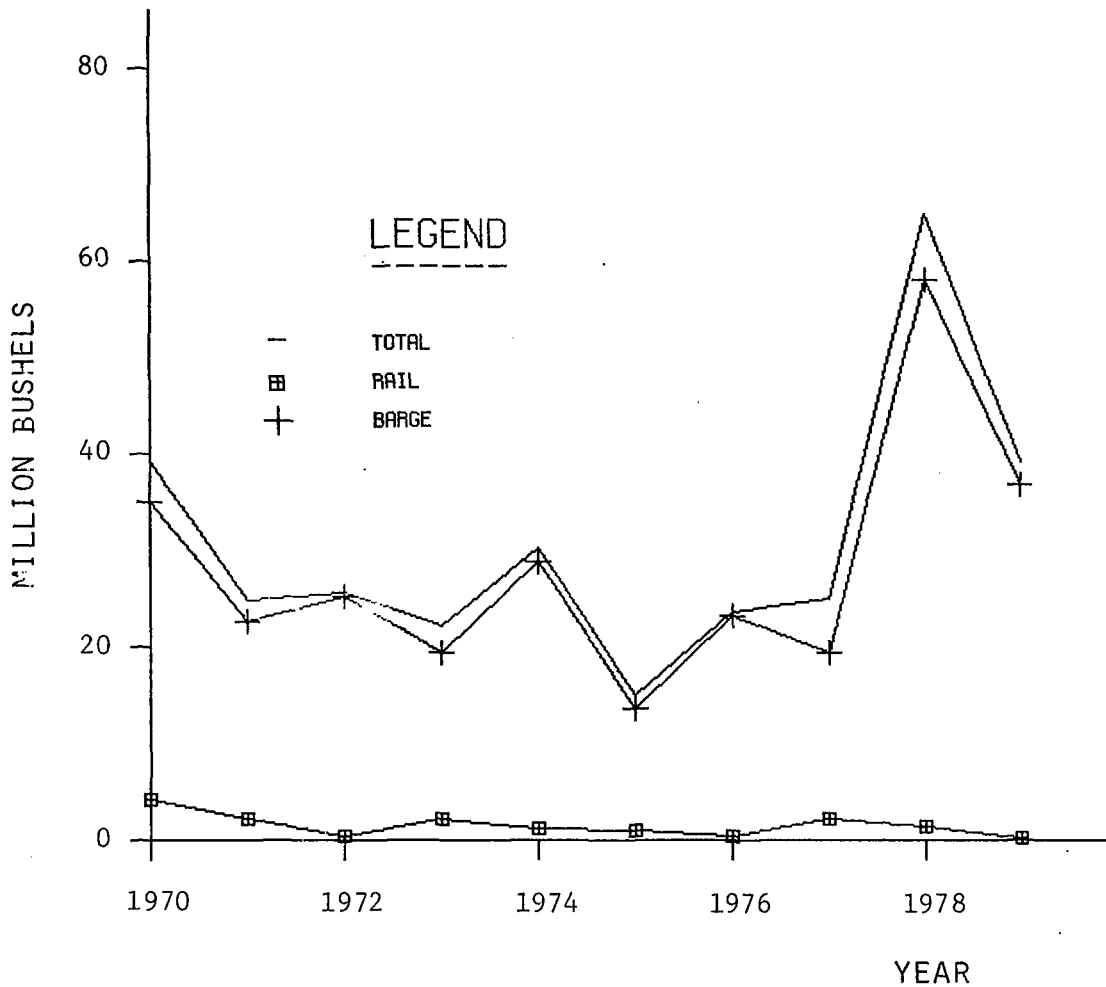


Durum - Figure 22

Shipments of durum from the Twin Cities ranged from 3.2 million bushels in 1971 to 12.8 million bushels in 1979. Railroads, which were the predominant mode of transportation in eight out of ten years, accounted for 56 percent of the 80 million bushels shipped. Shipments by barge, which accounted for 44 percent of total shipments, were greatest in 1979, accounting for 61 percent of the 12.7 million bushels shipped.

FIGURE 23

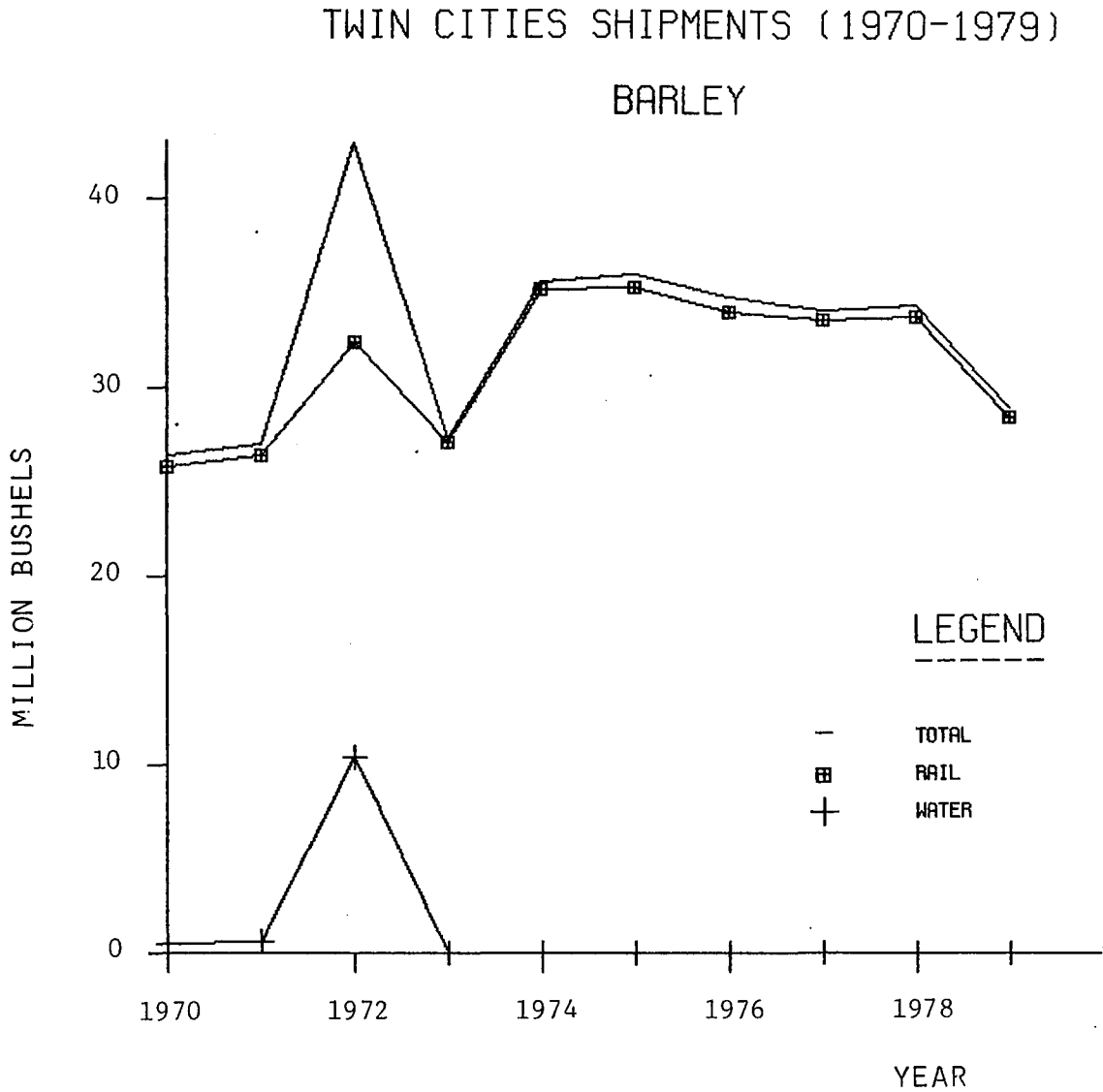
TWIN CITIES SHIPMENTS (1970-1979)
SOYBEANS



Soybeans - Figure 23

Terminal elevators shipped an estimated 310 million bushels of soybeans in the ten-year period. The large share (91 percent) was carried by barge (primarily to the Gulf). Shipments per annum ranged from 15 million bushels in 1975 to 65 million bushels in 1978 (a record year).

FIGURE 24



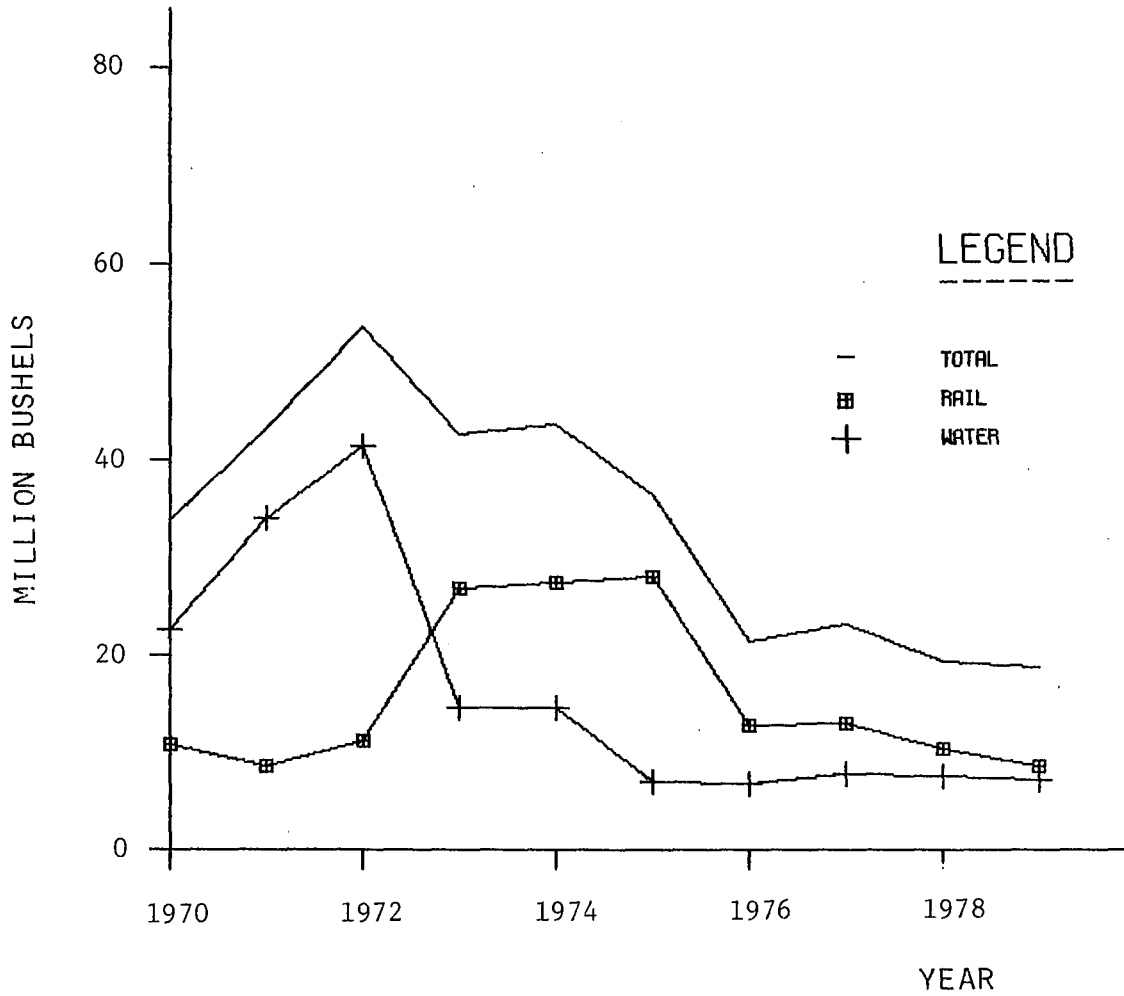
Barley - Figure 24

Barley shipments from the Twin Cities were relatively stable in the ten-year period. Shipments ranged from 26 million bushels in 1970 to 43 million bushels in 1972. Railroads accounted for 96 percent of the 327 million bushels shipped. Shipments by barge were significant only in 1972 (ten million bushels), reflecting export demand.

FIGURE 25

TWIN CITIES SHIPMENTS (1970-1979)

OATS



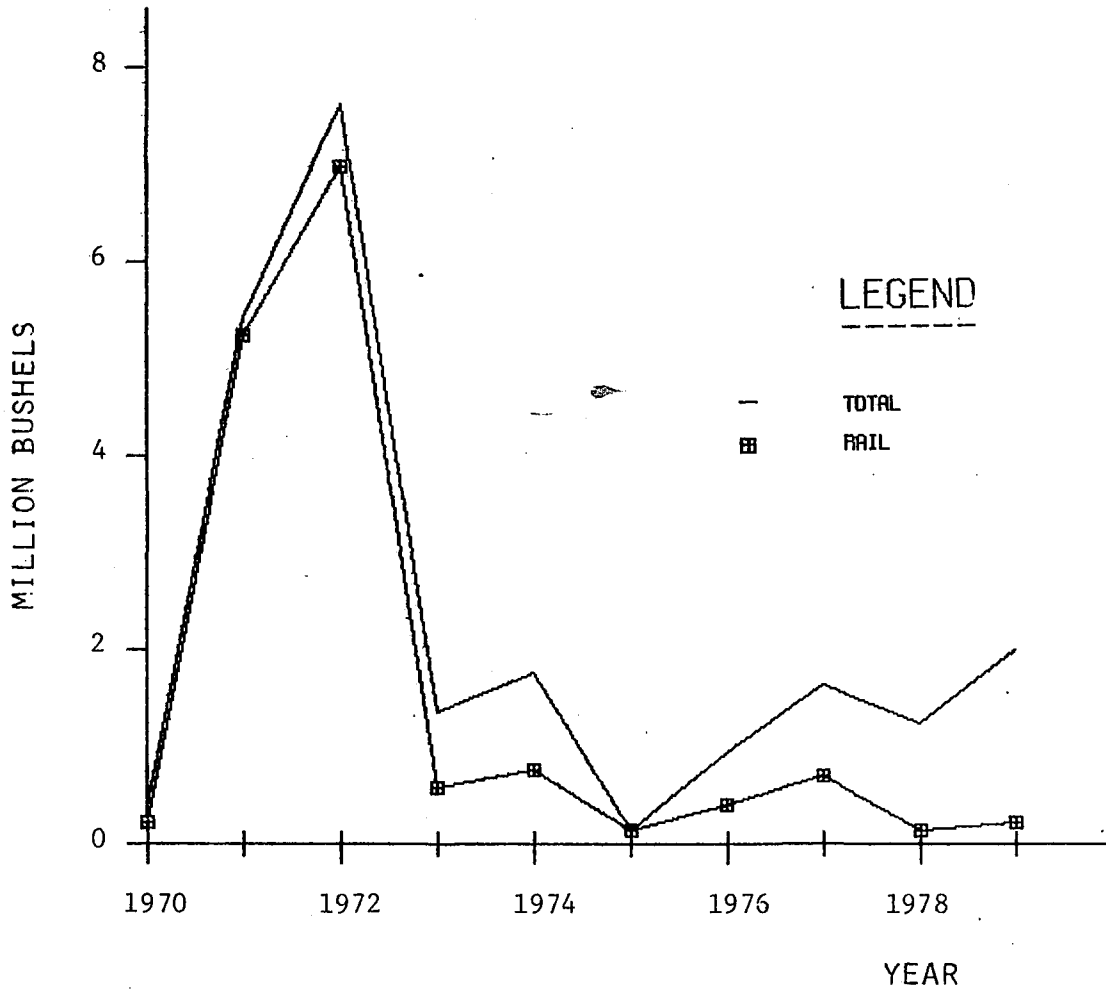
Oats - Figure 25

The volume of oats shipped from the Twin Cities steadily declined in response to reduced production and export demand. Shipments declined from 54 million bushels in 1972 to 18.7 million bushels in 1979. Barges, which were the predominant mode prior to 1973, accounted for 49 percent of the 336 million bushels shipped in the decade. Railroads accounted for 50 percent of the shipments over the ten-year period.

FIGURE 26

TWIN CITIES SHIPMENTS (1970-1979)

FLAX



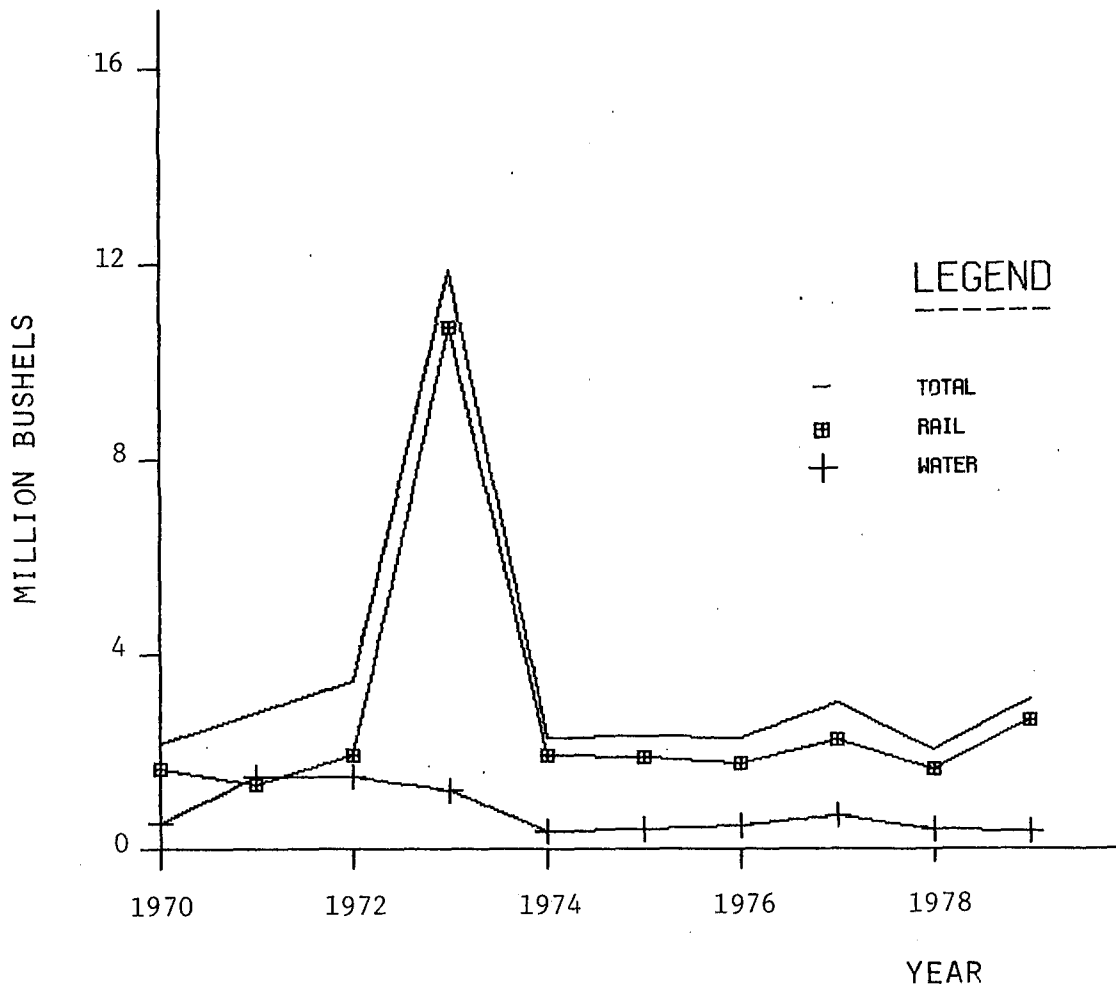
Flax - Figure 26

The majority of flax received in the Twin Cities is processed. Shipments from terminal elevators were an estimated 22.5 million bushels in the ten-year period. Railroads accounted for 68 percent of the shipments. Truck shipments (not shown) accounted for 32 percent of the shipments. The large share of the truck shipments were local to in-state processors.

FIGURE 27

TWIN CITIES SHIPMENTS (1970-1979)

RYE

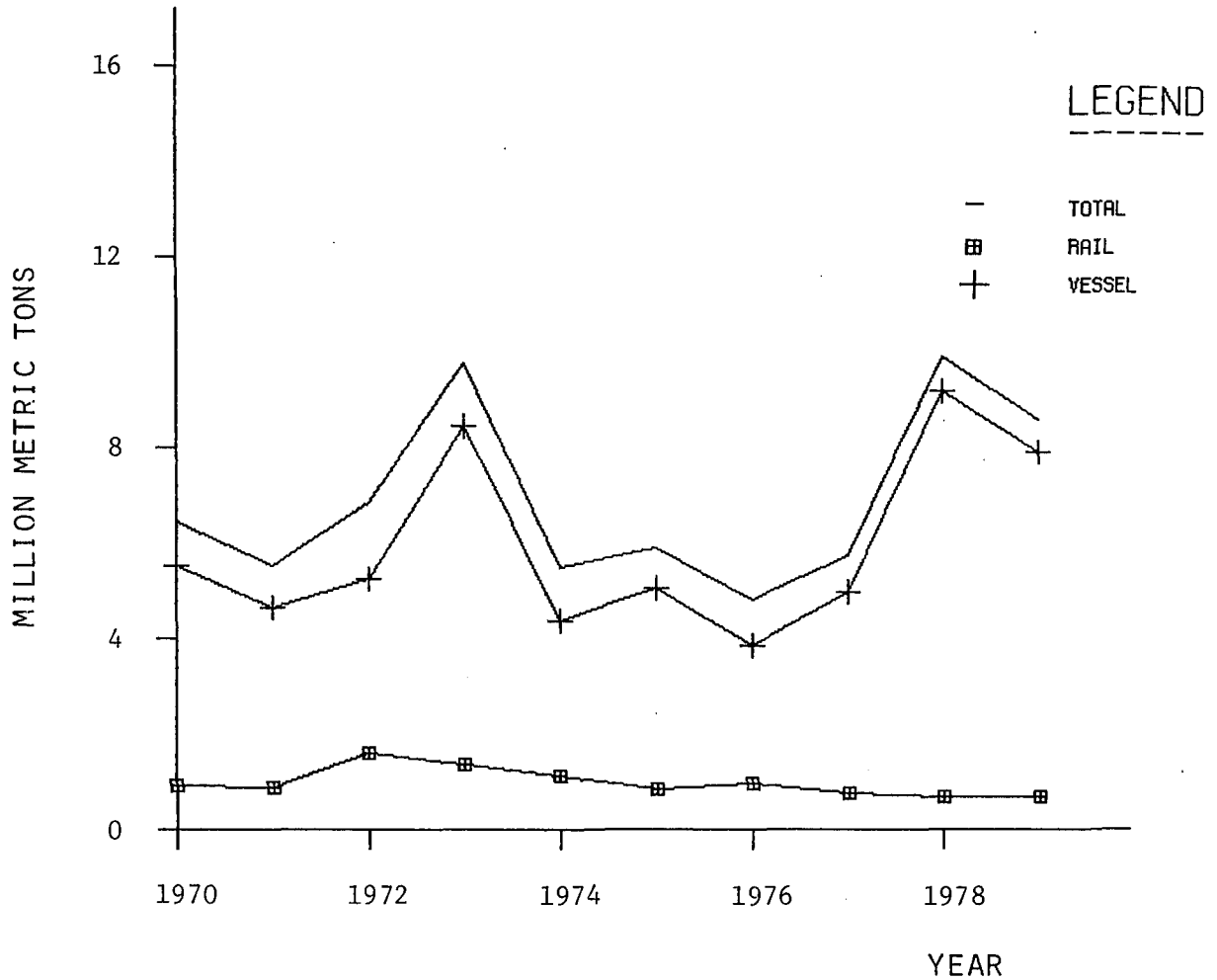


Rye - Figure 27

Railroads accounted for 78 percent of the 35 million bushels of rye shipped from terminal elevators in the Twin Cities in the decade. Barges accounted for 22 percent of the shipments. Shipments were greatest in 1973 (11.8 million bushels) and lowest in 1978 (2 million bushels).

FIGURE 28

DULUTH-SUPERIOR SHIPMENTS (1970-1979)
ALL COMMODITIES



DULUTH/SUPERIOR

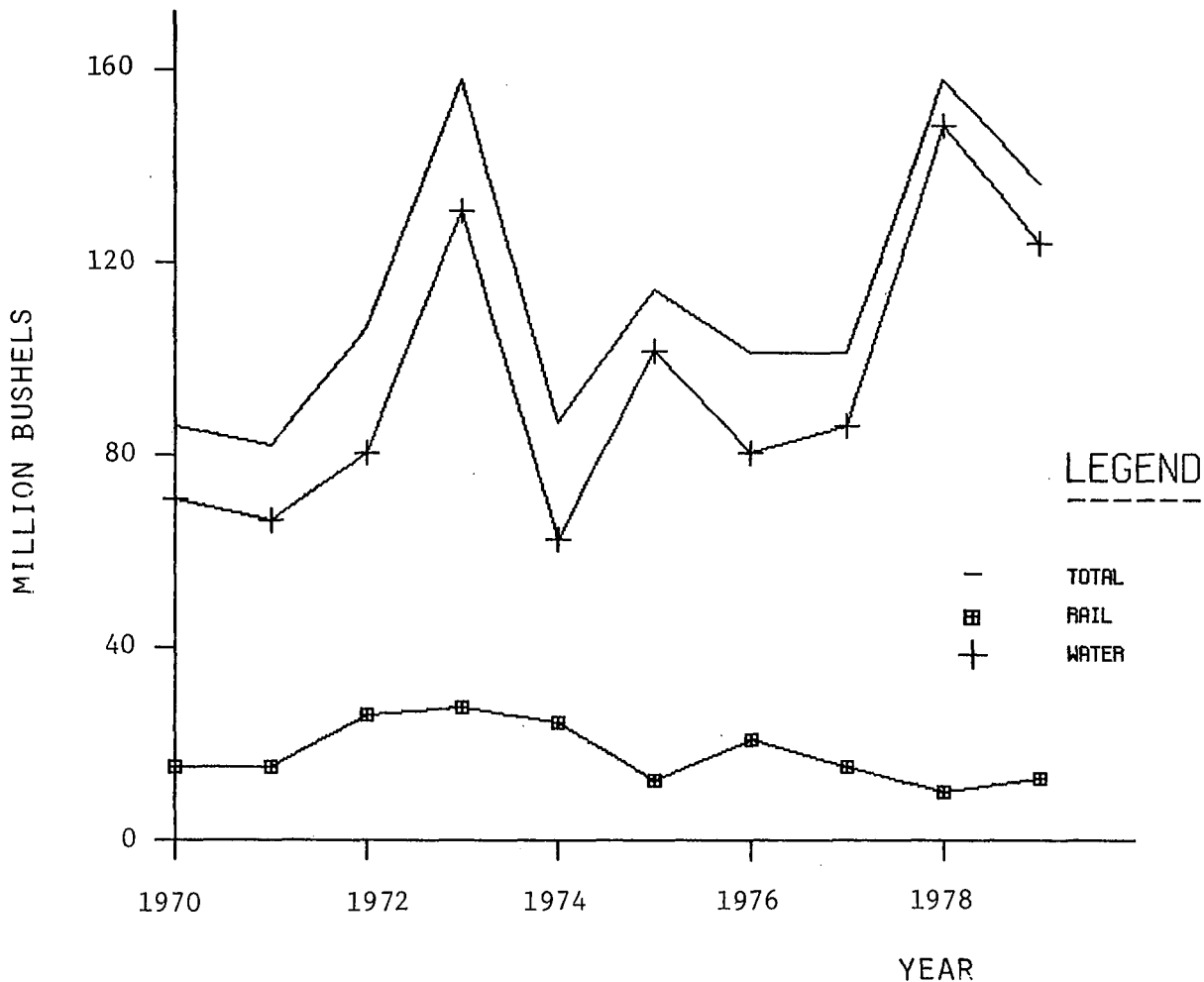
All Commodities - Figure 28

Roughly 69 million metric tons of grain (equivalent to 2.5 billion bushels of wheat) were shipped from terminal elevators located in Duluth/Superior during the 70's. The largest share (86 percent) of these shipments were by vessel. Railroads accounted for 14 percent of total shipments. Shipments were greatest in 1973 (9.8 million metric tons) and 1978 (9.9 million metric tons). Only 4.8 million metric tons were shipped in 1976, the second year of drought in the 70's.

FIGURE 29

DULUTH-SUPERIOR SHIPMENTS (1970-1979)

WHEAT



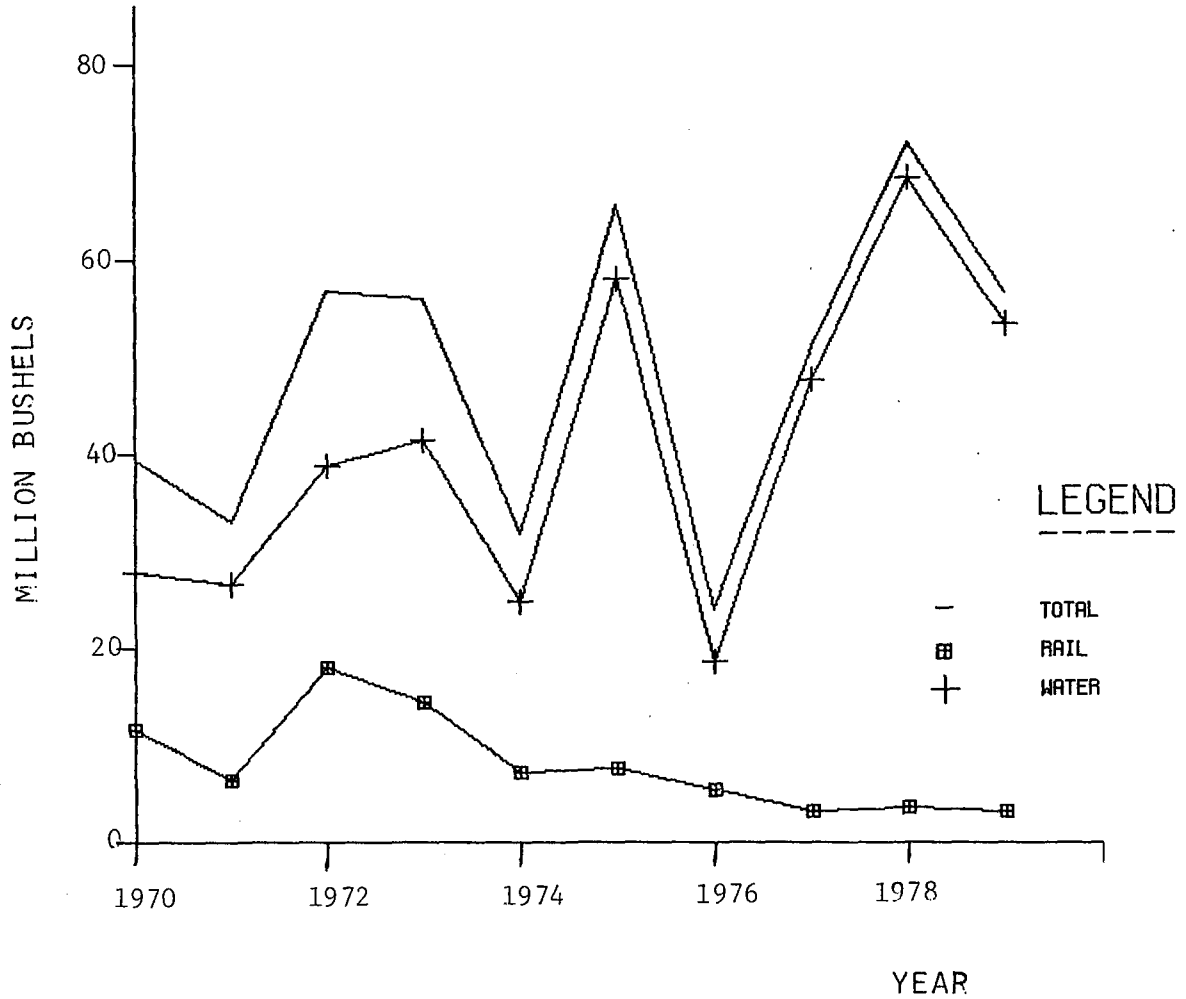
Wheat - Figure 29

Wheat shipments (durum not included) from Duluth/Superior fluctuated from a low of 82 million bushels in 1971 to a high of 158 million bushels in 1973 and 1978. Roughly 84 percent of the 1.13 billion bushels shipped in the decade were carried by vessel, either by salty or laker. Rail shipments east to grain processors were relatively stable in the decade, accounting for 16 percent of total wheat shipments.

FIGURE 30

DULUTH-SUPERIOR SHIPMENTS (1970-1979)

DURUM



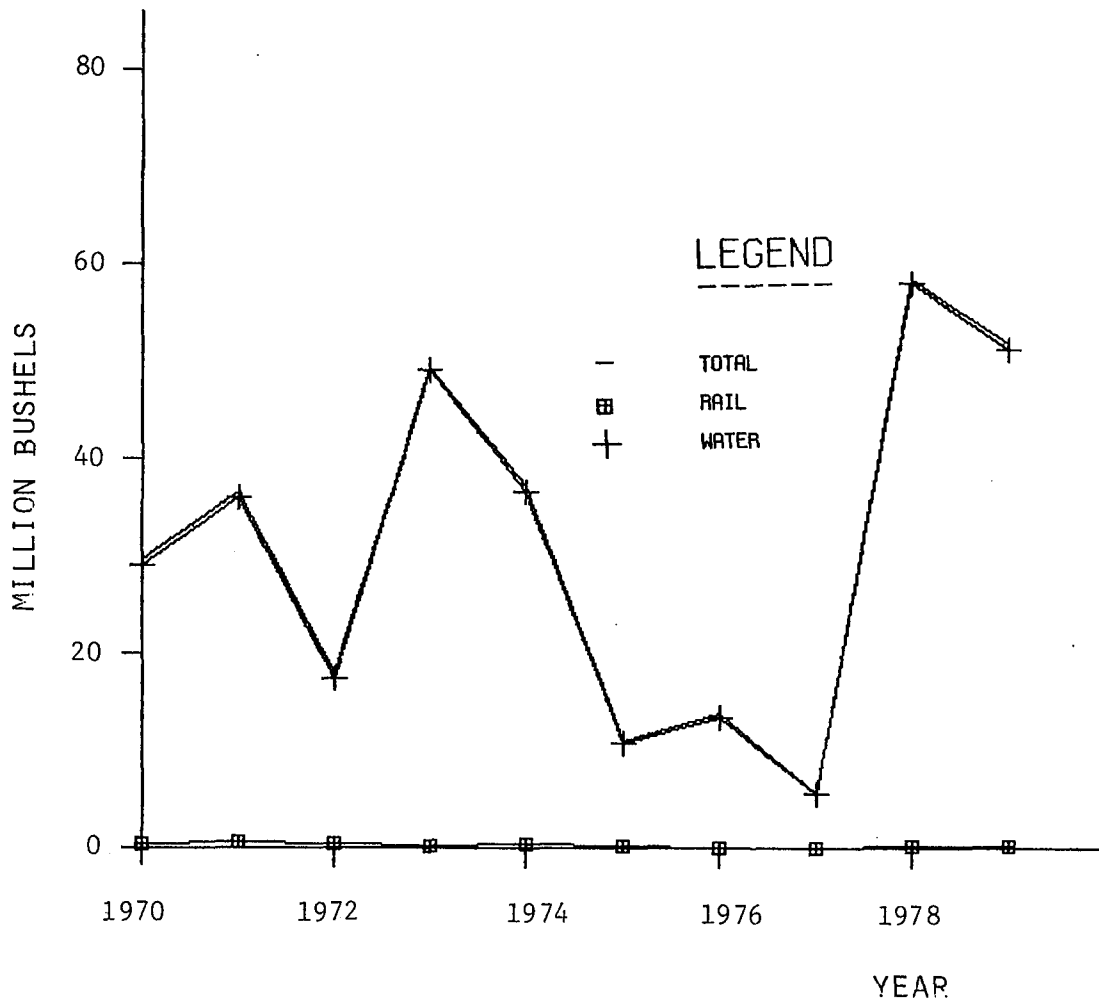
Durum - Figure 30

Durum shipments fluctuated considerably to a high of 72 million bushels in 1978 from a low of 24 million bushels in 1976. Vessels were the predominant mode of transportation, accounting for 82 percent of the 486 million bushels shipped. Shipments by rail, which declined throughout the decade, accounted for 18 percent of total shipments.

FIGURE 31

DULUTH-SUPERIOR SHIPMENTS (1970-1979)

CORN



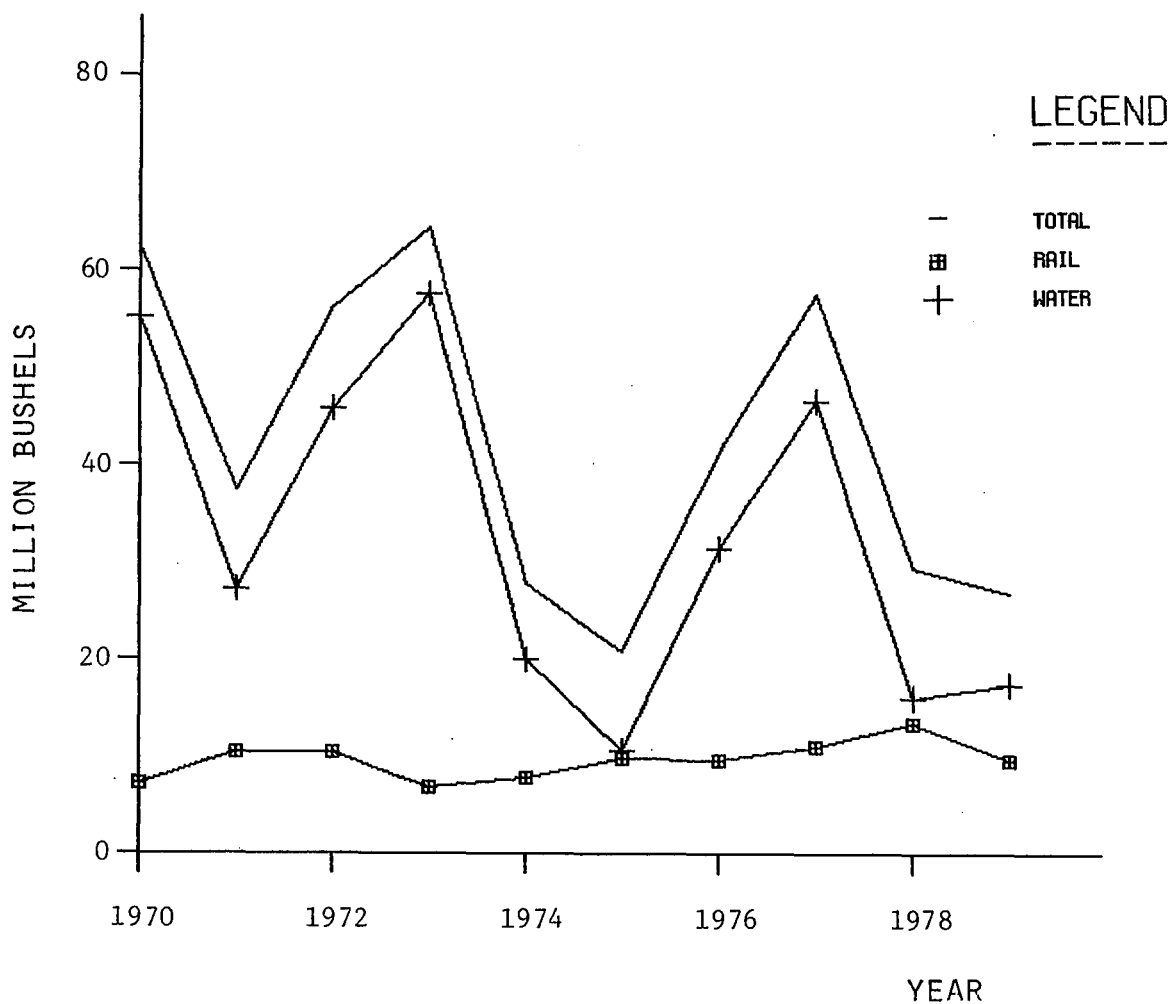
Corn - Figure 31

Roughly 312 million bushels of corn were shipped from lake terminal elevators located in Duluth/Superior in the 70's. Shipments per year ranged from 5.6 million bushels in 1977, a drought year, to 59 million bushels in 1978. Virtually all of the shipments were by vessel.

FIGURE 32

DULUTH-SUPERIOR SHIPMENTS (1970-1979)

BARLEY



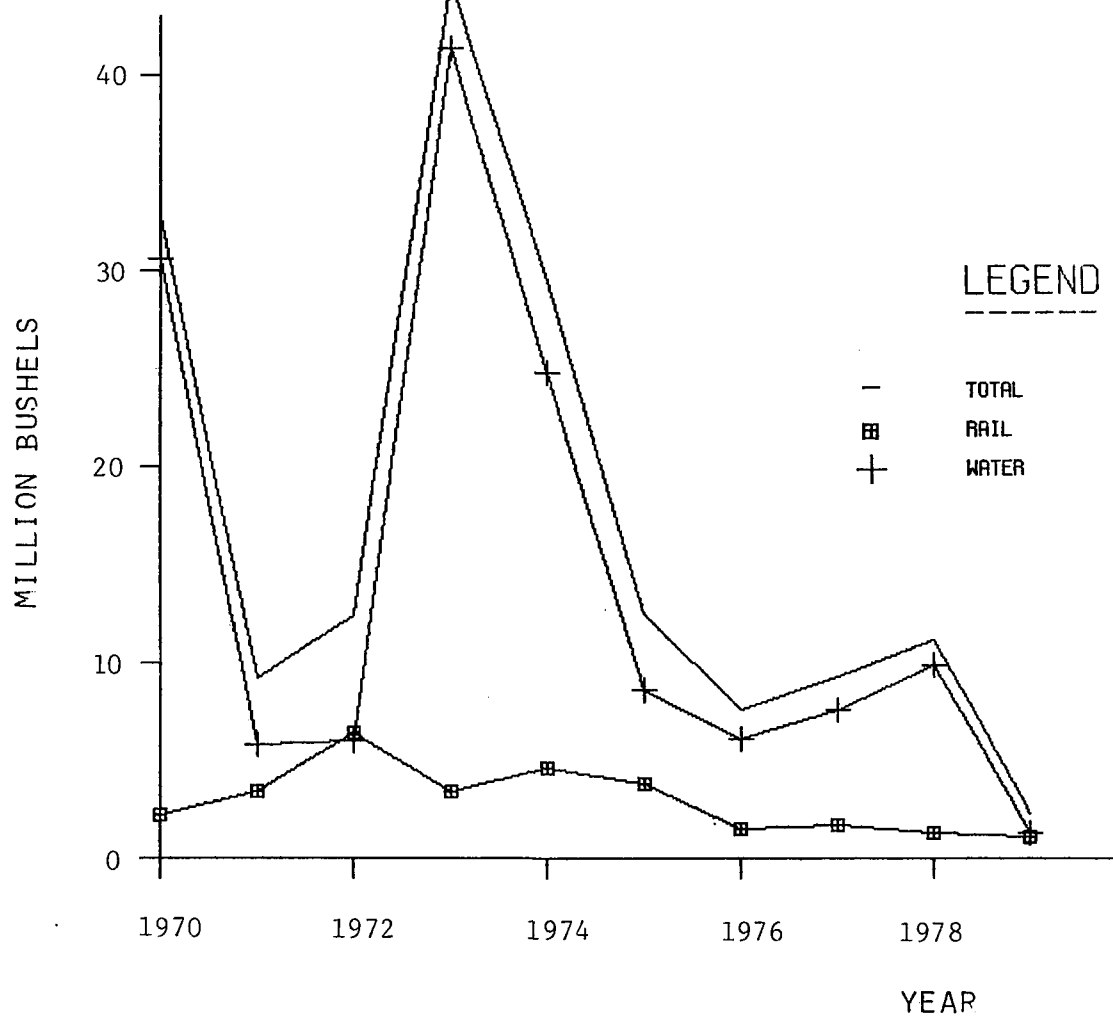
Barley - Figure 32

Barley shipments fluctuated considerably over the ten-year period from 21 million bushels in 1975 to 62 million bushels in 1973. Vessels were the predominant mode of transportation in all ten years, accounting for 77 percent of the 424 million bushels shipped. Rail shipments, primarily east to maltsters, accounted for 23 percent of the shipments.

FIGURE 33

DULUTH-SUPERIOR SHIPMENTS (1970-1979)

OATS

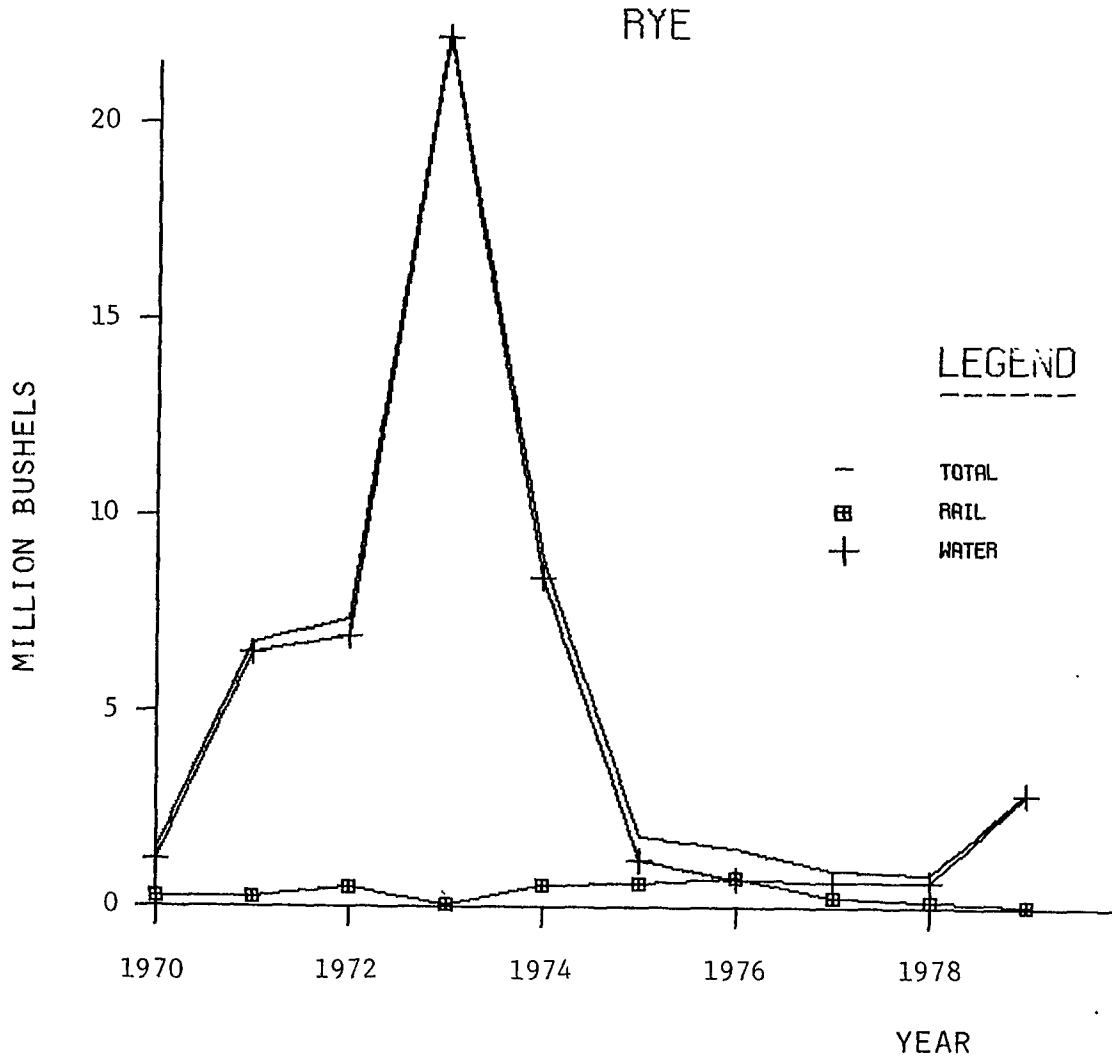


Oats - Figure 33

The volume of oats shipped ranged from 45 million bushels in 1973 to only 2.3 million bushels in 1979. Over 80 percent of the 171 million bushels shipped in the decade were by vessel. Rail shipments, which peaked in 1973 (6.4 million bushels), steadily declined to a low of one million bushels in 1979.

FIGURE 34

DULUTH-SUPERIOR SHIPMENTS (1970-1979)



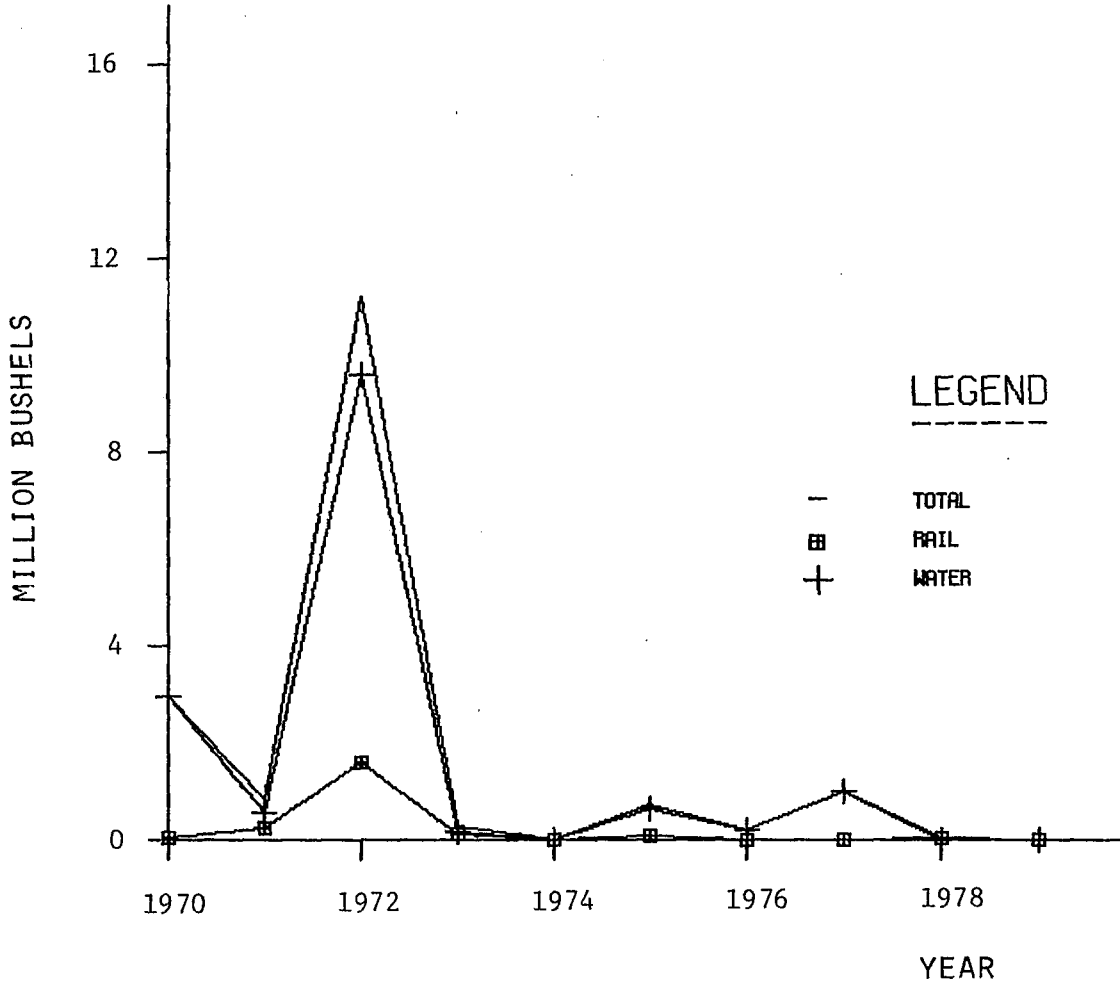
Rye - Figure 34

Roughly 55 million bushels of rye were shipped out of Duluth/Superior in the 70's. A large share (85 percent) of the shipments occurred prior to 1975. Over 90 percent of the volume shipped moved via vessel. Shipments were greatest in 1973.

FIGURE 35

DULUTH-SUPERIOR SHIPMENTS (1970-1979)

FLAX



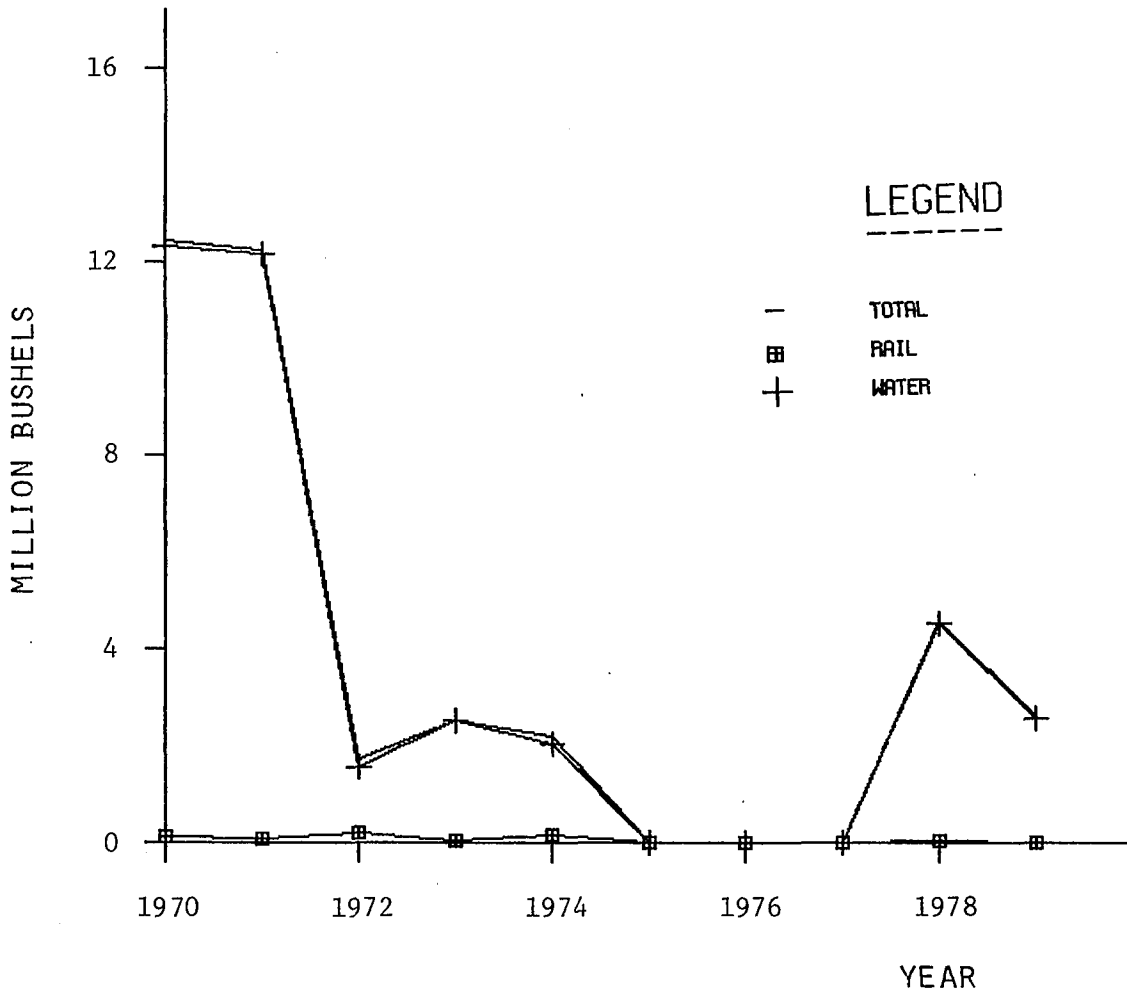
Flax - Figure 35

Very little flax is marketed in Duluth/Superior. Shipments topped one million bushels in 1970 and in 1972 only. Vessels carried 88 percent of the 17 million bushels shipped in the ten-year period.

FIGURE 36

DULUTH-SUPERIOR SHIPMENTS (1970-1979)

SOYBEANS



Soybeans - Figure 36

A relatively small volume of soybeans were shipped in the 70's. Virtually all of the 38 million bushels shipped in the decade were by vessel. Shipments topped 12 million bushels in 1970 and 1971.

Sunflowers

The volume of sunflowers shipped via vessel from the Duluth/Superior port increased from 17,000 metric tons in 1971 to 1.2 million metric tons in 1979. Table 7 (below) shows the dramatic increase in sunflower shipments during the decade. Sunflowers, which are light in weight, are a bright spot for Duluth/Superior, with its draft limitations.

TABLE 7

Lake Shipments of Sunflowers from Duluth/Superior
1970-1980

<u>Year</u>	<u>Shipments</u> (1,000 metric tons)
1970	--
1971	17
1972	142
1973	178
1974	165
1975	207
1976	288
1977	534
1978	1,162
1979	1,213
1980	<u>1,258</u>
TOTAL	5,164

Source: Minneapolis Grain Exchange Annual Report

SECTION IV

RIVER TERMINAL ELEVATORS IN RED WING AND WINONA

During the 70's, the river terminal elevators located in Red Wing and Winona emerged as major market outlets for country elevators located in southeastern and south central Minnesota. Virtually all of the grain (primarily corn and soybeans) moving to and from these markets involved a truck-barge transfer. Grain barge loadings in Red Wing and Winona increased from 21 million corn equivalent bushels in 1972 to 65 million corn equivalent bushels in 1979. Table 8 (below) shows grain barge loadings in Red Wing and Winona in 1972, 1975, 1977, 1978 and 1979.

Table 8

Grain Barge Loadings at Red Wing and Winona

<u>Year</u>	<u>Corn Equivalent Bushels</u>
1972	22 million
1975	23 million
1977	27 million
1978	52 million
1979	65 million

Source: Waterborne Commerce of the U.S. and Minneapolis Grain Exchange Annual Reports.

The relative volume of corn moving through the Red Wing/Winona market in comparison with corn volume moving through the Twin Cities area and Duluth/Superior markets is shown in Table 9 (below). In the three years shown (selected because data was available), corn receipts in Red Wing/Winona, as a percent of total terminal elevator corn receipts, were greatest in 1979, accounting for 22 percent of the 246 million bushels received in the three markets. The relative share of the Twin Cities area market, which was 74 percent in 1972, was only 55 percent in 1979. Part of this increase can be explained by the opening of Interstate I90, which greatly improved east-west travel conditions across southern Minnesota. Also, barge operating costs to the Gulf are lower from Winona and Red Wing because of the shorter distance, fewer lockages, and less river congestion than in the Twin Cities.

Table 9

Terminal Elevator Corn Receipts* in
Minnesota in 1972, 1975 and 1979
(million bushels)

<u>Year</u>	<u>Total</u>	<u>Twin Cities</u>		<u>Duluth/Superior</u>		<u>Red Wing/Winona</u>	
	<u>Receipts</u>	<u>Receipts</u>		<u>Receipts</u>		<u>Receipts</u>	
	bu.	bu.	(%)	bu.	(%)	bu.	(%)
1972	132	98	(74)	19	(14)	15	(11)
1975	119	87	(73)	13	(11)	19	(16)
1979	246	136	(55)	57	(23)	53	(22)

*Includes receipts from country elevators in neighboring states.

SECTION V

COUNTRY ELEVATOR SHIPMENTS TO DEEPWATER PORTS AT THE GULF OF MEXICO AND THE PACIFIC NORTHWEST

Multiple-car rates were introduced in southern Minnesota in 1972 for export corn and soybeans via the Gulf of Mexico. This provided country elevators capable of loading multiple-car units an attractive alternative to traditional market outlets in the Twin Cities, Duluth/Superior and Red Wing/Winona. These lower rates, introduced by railroads to compete with truck-barge competition to the Gulf of Mexico and to obtain more efficient car utilization, provided incentives to country elevators for further investment in facilities capable of loading multiple-car units. In 1974, 19 country elevators in southern Minnesota could load multiple-car units. By 1979, the number of country elevators in the state capable of loading 15 or more cars for one shipment was 55.

This section evaluates the volume of corn and soybeans shipped directly between Minnesota country elevators and deepwater ports at the Gulf of Mexico and in the Pacific Northwest. The analysis is limited to the 1977 and 1979 calendar years due to the absence of reliable data on these types of movements. Data concerning the volume of grain shipped are based on two surveys conducted by the Department of Agricultural and Applied Economics at the University of Minnesota.

Corn

Direct rail shipments of corn from Minnesota country elevator sites to deepwater ports at the Gulf of Mexico and in the Pacific Northwest were an estimated 26.3 million bushels in 1977 and 95.1 million bushels in 1979. Table 10 shows the relative importance of direct shipments of corn to deepwater ports in comparison to traditional markets in the Twin Cities, Duluth/Superior and Red Wing/Winona. Roughly 21 percent of the 125 million bushels shipped to the major destinations in 1977 were to ports at the Gulf of Mexico (24.7 million bushels) and in the Pacific Northwest (1.6 million bushels). The Twin Cities market was predominant in 1977 accounting for 60 percent of the corn shipped.

Total corn shipments more than doubled in 1979 than in 1977, but direct shipments of corn to deepwater ports increased to 30 percent of the 311 million bushels shipped. Shipments to ports at the Gulf of Mexico and the Pacific Northwest were an estimated 56.5 and 38.6 million bushels, respectively.

Soybeans

Direct shipments of soybeans by country elevators in southern Minnesota to the Gulf of Mexico were an estimated four million bushels in 1977 and 12.8 million bushels in 1979. Table 11 (below) shows country elevator shipments of soybeans to the Gulf of Mexico, the Twin Cities area, Red Wing/Winona, Duluth/Superior and in-state processor. Soybeans were not shipped directly to the Pacific Northwest in either 1977 or 1979. However, such shipments did occur in 1981 and are expected to increase over the next few years.

Table 10

CORN SHIPMENTS BY MINNESOTA COUNTRY ELEVATORS
TO SELECTED DESTINATIONS IN 1977 AND 1979
(million bushels)

- - - - - Destinations - - - - -

YEAR	TOTAL SHIPMENTS bu. (%)		DIRECT TO DEEPWATER PORTS			MINNESOTA TERMINAL ELEVATORS						
			GULF OF MEXICO		PACIFIC NORTHWEST		TWIN CITIES AREA		RED WING/WINONA		DULUTH/SUPERIOR	
			bu.	(%)	bu.	(%)	bu.	(%)	bu.	(%)	bu.	(%)
1977	125.3	(100)	24.7	(20)	1.6	(1)	75	(60)	19	(15)	5	(4)
1979	310.8	(100)	56.5	(18)	38.6	(12)	114.7	(37)	52	(17)	49	(16)

Table 11

SOYBEAN SHIPMENTS BY MINNESOTA COUNTRY ELEVATORS
TO SELECTED DESTINATIONS IN 1977 AND 1979
(million bushels)

- - - - - Destinations - - - - -

YEAR	TOTAL SHIPMENTS	GULF OF MEXICO	TWIN CITIES AREA*	RED WING/WINONA	DULUTH/SUPERIOR	IN-STATE PROCESSORS
1977	44.2	4	32.8	7.4	0	unknown
1979	129.9	12.8	49.7	9.7	1.3	56.4

*The 1979 estimate does not include the processors in Savage.

SECTION VI

GRAIN TRANSPORTATION PROBLEMS AND PROSPECTS IN THE 80's

The future performance and requirements of the Upper Midwest grain transportation system will depend on future export policies, and export trends. The export policies of the U.S. and other industrialized countries will affect grain movements in the Upper Midwest as it affects export demand and supply. In the 70's, U.S. export policy was based on all-out production and aggressive export promotion. The primary force driving this policy was to use agricultural sales to acquire foreign exchange to help pay for oil imports. Whether or not U.S. export policy remains on this course remains in question as oil imports have declined in recent years. Furthermore, there is growing concern in the country that we are farming too intensively, and, in so doing, exporting our future soil fertility and production capacity. Whether or not future administrations encourage extensive conservation measures or continue all-out production and export policies, will greatly affect the future performance and requirements of the grain transportation system.

Export demand will depend on population growth and the ability of foreign countries to pay. Of major importance to Minnesota are the countries in which export demand grows. Continued growth in demand for corn and soybeans by countries bordering the Pacific ocean in southeast Asia will increase the importance of the Pacific Northwest outlet. Minnesota, located on the western edge of corn and soybean producing states, would then benefit due to its logistical advantage. Growth in Atlantic basin countries will generally benefit other areas more.

The ability to pay for grain will depend, in large, on the strength of the U.S. dollar. One of the driving forces behind the increase in farm exports during the 70's was the devaluing of the dollar in 1971 and 1973, and the continued weakness of the dollar throughout the decade. A strong dollar hurts farm export in two ways. First, it takes more dollars to buy an equivalent amount of agricultural products. Second, OPEC oil is priced in dollars so that when the dollar strengthens, the OPEC oil price to other countries increases in real terms; thus, reducing those countries' purchasing power for both food imports and oil imports.

Passage of the "Staggers Rail Act of 1980" and the "Motor Carrier Act of 1980" and proposed waterway user fees will also impact on the transportation of grain in the Upper Midwest as they affect the rate and service relationships among the competing modes of transportation.

Staggers Rail Act of 1980

The principle intention behind the passage of the Staggers Rail Act was to make the restructuring of both the physical rail system and the rail rate system easier for railroads so that they could improve their financial condition. As a result, there are many potential impacts for Minnesota shippers in the 1980's.

The Act accelerates the decision making process in both merger cases and branchline abandonment cases. Minnesota has already been affected in both areas. In 1980, the St. Louis - San Francisco was merged into the Burlington Northern forming a system which stretches from the Pacific Northwest to Chicago, Houston, Mobile and Pensacola. The increase in the number of branchline miles abandoned is evident from Table 1.

The new rate-making flexibility will make the railroads more competitive with truck-barge competition. One rate-making freedom allows railroads the freedom to raise rates to a maximum rate based on a percentage of the variable cost of service, providing they do not exercise market dominance for the commodity. Another provision allows railroads the freedom to reduce rates to meet truck and barge competition, or as long as their variable costs are covered.

Railroads are now allowed to enter into contracts with rate and service advantages for individual shippers. This provision will probably work to the disadvantage of smaller shippers with less market power. The result may also include better rail service to areas where production is greatest and where the large subterminal elevators are located.

The major thrust of the railroad industry in the 80's will be the continued development of unit-train movements and unit-train rates. The two major direct rail routes connecting Minnesota to the world will continue to be the deepwater ports at the Gulf of Mexico and in the Pacific Northwest. Direct rail shipments to Mexico, which began in 1980, will also grow in importance due to the logistical advantage of direct rail over barge to inland locations in Mexico.

Motor Carrier Act of 1980

The primary intention behind the Motor Carrier Act of 1980 was to eliminate unnecessary regulations in the trucking industry, especially those that led to inefficiencies. One provision, designed to reduce circuitous routing and empty backhauls, expands the list of commodities exempt from economic regulation. As a result, truckers now hauling grain into the Twin Cities can now backhaul agricultural inputs such as animal feed and seed. The impact will be to increase truck revenues and reduce costs to shippers. Another provision reduces entry restrictions into the industry.

Perhaps of greater significance to the trucking industry in the 80's will be the continued development of the large subterminal elevators in the countryside and the growing problem of highway, bridge and rural road maintenance.

The emergence of the large subterminal elevators and increasing yields means more grain is being gathered in fewer points. Grain must come a longer distance, suggesting that an increasing share of grain truck movements will take place over local roads. The consequences of this development work two ways. First, truckers may benefit by a more consistent flow of local

traffic and spend less time in the long lines which has been a major problem in Twin Cities and Duluth/Superior. Second, the added traffic on the highways, rural roads and bridges will place additional burden on a system already facing serious problems. Financing the maintenance of our highways, rural roads and bridges will be a major issue in the 80's.

Waterway User Fees and Port User Fee Proposal

Waterway user charges were first instituted in 1980 with a tax of 4¢ per gallon on fuel used for commercial navigation. This tax is scheduled to increase to 10¢ per gallon in 1985. Recently, there have been proposals to institute "full cost recovery" user charges. This would increase the cost of barge transportation from Minnesota to the Gulf by 10 to 20¢ per bushel and have a significant impact on both grain flows and farm incomes.

Port user charges to recover the costs of harbor and channel maintenance at Great Lakes and ocean ports have also been proposed. Some of the proposals would be detrimental to Great Lakes ports such as Duluth/Superior and favorable to high Atlantic and Gulf ports. The impact of port user charges on Minnesota will depend on which proposal, if any, is finally adopted.

Conclusion

Minnesota agriculture will continue to depend on an efficient transportation system to remain competitive in world markets. Many of the trends that began in the 70's will continue in the 80's. Important will be the maintenance of a highway and rural road and bridge infrastructure capable of delivering grain to both regional subterminals and the terminal elevator markets. Retaining a viable rail system with competitive rates to deepwater ports, and processors in the east, is also vital. Transportation decisions made in the early 80's, addressing rail and motor deregulation, waterway user fees, and financing the maintenance of the state's highway and rural road and bridge system, will be of long term importance to Minnesota and surrounding states.

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