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Commodity origin and destination of barge traffic for the Upper Missouri River

James H. Page
University of Nebraska at Omaha

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COMMODITY ORIGIN AND DESTINATION OF BARGE TRAFFIC
FOR THE UPPER MISSOURI RIVER

A Thesis
Presented to the
Department of Geography
and the
Faculty of the Graduate College
University of Nebraska at Omaha

In Partial Fulfillment
of the Requirements for the Degree
Master of Arts

by
James H. Page
April, 1972

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Accepted for the faculty of the Graduate College of the University of Nebraska at Omaha, in partial fulfillment of the requirements for the degree Master of Arts.

Graduate Committee Harold J. Retanick Geog.
Name Department
Lee C. Bush Geog
David Scott Political Science

Harold J. Retanick
Chairman

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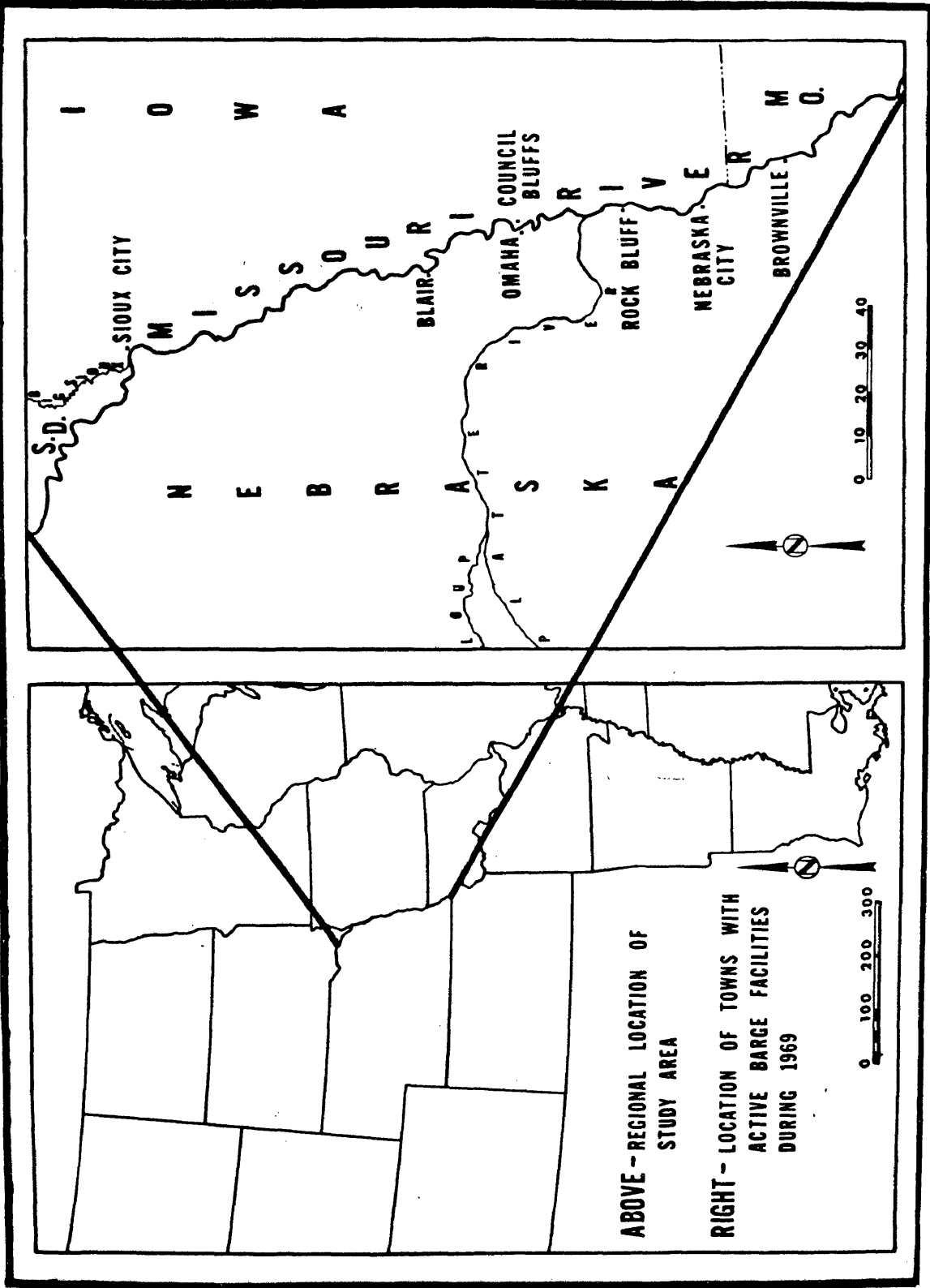
INTRODUCTION

The National system of harbors, rivers, and waterways carried over one and one quarter billion tons of commercial commodities during 1967, principally in bulk items which did not require rapid movement. Prominent among these commodities were 462 million tons (about 137 billion gallons) of petroleum products, 206 million tons of coal and coke, and 146 million tons of sand, gravel and stone.¹ The waterways annually carry about 250 billion ton-miles of freight traffic, or approximately 16 percent of the total ton-milage of the Nation's intercity traffic.² The commodities mentioned above, which are associated primarily with the industrial East, constituted 73.6 percent of the total tonnage carried on our inland waterways in 1967.³ Perhaps because of this strong orientation toward the industrial East, little has been done towards the investigation of barge traffic connected with a predominantly agricultural region such as the Missouri River Basin.

¹ Hull, William J. and Hull, Robert W. The Origin and Development of the Waterways Policy of the United States, (Washington, D.C. National Waterway Conference, Inc., 1967), p. 41.

² A ton-mile equals one ton of a commodity transported one mile.

³ Farris, M. T. and McElhiney, P. T. Modern Transportation, Selected Readings, (Boston: Houghton Mifflin Company, 1967), p. 202.



Part A

MAP I

Part B

PURPOSE

The purpose of this thesis will be to investigate the origin and destination of commodities constituting the major portion of barge traffic to the facilities located on the upper Missouri River between Sioux City, Iowa and Rulo, Nebraska. (Refer to Map I, page 2.)

The selection of the topic to be analyzed was dependent upon several factors, the two most important being: (1) that the origin and destination of commodities associated with barge traffic on this section of our inland waterway was not known, and (2) that the reasons for rapid growth in the total tonnage of commodities since the mid-1950's were not common knowledge. The U. S. Army Corps of Engineers District Office is located in Omaha, Nebraska, thus providing a source for certain statistics and verbal assistance pertinent to the topic.

DATA PROBLEM

The Corps of Engineers provided considerable information of the total tonnages of commodities carried into and out of the study area. However, the information was limited in scope due to the method of commodity reporting which is used by the barge lines and employed by the Corps. This method included the division of the study area into three groupings of facilities for the reporting of tonnages. These groupings consisted of:

- A) The Sioux City Region; consisting of Sioux City, Iowa, and Blair, Nebraska.
- B) The Omaha Region; consisting of Omaha and Plattsmouth, Nebraska, and Council Bluffs, Iowa.
- C) The Nebraska City Region; consisting of Rock Bluff, Nebraska City, Brownville, and Rulo, Nebraska.

The practice of grouping "like" commodities under one title, and the subsequent reporting of one tonnage by the barge lines and Corps, posed problems of commodity and tonnage determination, an example being:

Farm Products: to include corn, rye, oats, sorghum grains, wheat, soybeans, miscellaneous farm products, and others.

Methods of commodity reporting in connection with the policy of disclosure used by the Corps of Engineers are the paramount reasons for the lack of information as to the origin, nature, and destination of commodities moved on our inland waterways. This policy of disclosure, as explained in a letter received from the Chief of Waterborne Commerce Statistics Center; New Orleans, Louisiana, is quite prohibitive:

"I regret to advise that shipping data furnished to the Department of Army, Corps of Engineers, by vessel operators and others are obtained upon the understanding that they will not be disclosed and will be used in the compilation of port or waterborne statistics. Because it has been determined that the release of information contained in the Port to Port listing will tend to identify operators, this is considered disclosure. Accordingly in consonance with department policy and federal statutes these data may not be released." ⁴

⁴ Taken from a letter received from the Waterborne Commerce Statistics Center; New Orleans, Louisiana, 13 Oct., 1969.

Because of disclosure problems encountered in the collection of data, alternate methods of data collection were employed. The general data finally utilized was obtained mainly from personal interviews, questionnaires, and the files and records maintained by some of the facilities. (An example of the questionnaire used is found in Appendix I.) Further information was obtained from grain merchants, railroad and truck line officials, along with city and municipal officials.

REVIEW OF LITERATURE

A review of geographic and related literature brought to light several very helpful articles. Although the majority of these articles are oriented toward ocean-going traffic, they contributed views and ideas about commodity flow, commodity origin and destination, and barging that were helpful in the writing of this thesis.

J. Edwin Becht's (1952) work is one of the few studies which can be found that deals with commodity movement in connection with river barge traffic. In his work Becht deals not only with commodity movement, but also with the characteristics of the waterway, traffic patterns of primary and secondary commodities, the disadvantages and advantages of barge traffic, and barging equipment on the Illinois waterway.⁵

⁵Becht, J. Edwin. Commodity Origins, Traffic, and Markets Accessible to Chicago Via The Illinois Waterway, (Chicago: Illinois River Carrier's Association, 1952)

Although oriented toward industrial connections with, and usage of the Great Lakes maritime traffic at Chicago, Harold M. Mayer's (1955) work deals in part with barging practices by these industries.⁶ David M. Solzman's (1961) study provided ideas and lines of thought dealing with the advantages and disadvantages of barge usage by Chicago industries to extend the transportation of their goods into the inland waterways.⁷

A 1958 work by G. Weigend not only gives a good description of the functions of a maritime port, but also a description of the three aspects of cargo that are of basic concern whether dealing with maritime or inland traffic: volume, nature, and direction of flow.⁸

Donald Patton's (1956) paper shows the development and flow of traffic on inland waterways, but fails to give a regional breakdown of commodity origin and destination.⁹ His (1958) study gives a regional breakdown of the commodities which are connected mainly to maritime ports. This paper does

⁶ Mayer, Harold M. "Prospects and Problems of the Port of Chicago." Economic Geography, XXXI, (April, 1955), pp. 95-125.

⁷ Solzman, David M. Waterway Industrial Sites: A Chicago Case Study. Research Paper Number 107. (Chicago: Department of Geography, University of Chicago, 1961.)

⁸ Weigend, G. "Some Elements in the Study of Port Geography." Geographical Review, XXXVIII, (1958), pp. 185-200.

⁹ Patton, Donald. "The Traffic Pattern of American Inland Waterways." Economic Geography, XXXII, (January, 1956), pp. 29-37.

not show the traffic patterns on the inland waterways since most of the collection and distribution of commodities for these ports were moved via rail or truck.¹⁰

METHOD

The purpose of this thesis will be accomplished utilizing ideas and lines of thought gained from the above articles. The commodity origin and destination for 1969, of the items constituting the major part of the barge traffic for the study area, shall be presented in a series of maps. These maps will also aid in the overall description of the areas influenced by the usage of barges on the study section of the upper Missouri River. Descriptive coverage of the distribution of minor inbound and outbound commodities shall be given where mapping is deemed impractical. It is felt that from this study, information as to the usage and importance of barge traffic and its related commodities can be shown for the area under study.

¹⁰ Patton, Donald. "General Cargo Hinterlands of New York, Philadelphia, Baltimore, and New Orleans." Annals of the Association of American Geographers, XXXVIII, (1958), pp. 436-455.

CHAPTER ONE

HISTORICAL DEVELOPMENTS AND PHYSICAL FEATURES OF BOTH THE MISSOURI RIVER BASIN AND THE UPPER MISSOURI RIVER

HISTORY OF MISSOURI RIVER TRAFFIC

Marquette and Joliet were the first white men to leave a record of seeing the Missouri River. They reached the mouth of the Missouri River in 1673. Indians had informed them of a great stream which their tribe called Pekitanoui, and as Marquette and Joliet came down the Mississippi River they were appalled by what they saw. Father Marquette wrote:

"As we were gently sailing down the still clear water, we heard a noise of a rapid into which we were about to fall. I have seen nothing more frightful, a mass of floating islands came from Pekitanoui, so impetuous that we could not without great danger expose ourselves to pass across.¹

A few French fur traders worked their way up the Missouri in the century following its discovery by Marquette and Joliet. Although their exploration was limited in nature it did make an impact on the development of the region. Later, due to the combined influence of the Lewis and Clark Expedition of 1804-1806, the growing demand for furs by the peoples of the world, and the introduction of the steamboat or packet on the Missouri River, the Basin experienced a rapid growth in economic

¹ Vestal, Stanley. The Rivers of America, The Missouri, (New York, Farrar and Rinehart Inc., 1945), p. 3.

importance. For the next half century the Missouri River was a principal highway for the largest business in North America during the period--the fur trade.²

Slowly at first then gaining momentum, the number of people and their supplies moving West accounted for an increasing percentage of the tonnage handled on the Missouri River. Although this tonnage soon exceeded in quantity that of the furs carried on the Missouri River, it wasn't until the 1850's that its value surpassed that of furs. A large portion of the travelers on the Santa Fe and Oregon Trails began their journey with a boat trip up the Missouri River. Thousands of wagons and tons of supplies destined for the trails across the Great Plains traveled by boat from St. Louis or St. Charles to Kansas City, St. Joseph, Nebraska City, or Omaha.³

The development of the railroad within the Missouri River Basin during the five year period preceeding the Civil War foreshadowed the end of steamboating on the Missouri River. In 1856 the Missouri Pacific Railroad from St. Louis to Kansas City was opened to Jefferson City, Missouri. The river suffered a more serious loss in 1859 when the Hannibal and St. Joseph Railroad reached the Missouri River at St. Joseph.

² Mattison, Ray H. "The Upper Missouri Fur Trade: Its Methods of Operation," Nebraska History, XXXXII (March, 1961), p. 1.

³ Hunter, Louis C. Steamboats on the Western Rivers, (Cambridge: Harvard University Press, 1949), p. 48.

This new railroad shortcircuited the Missouri and diverted traffic handled by St. Louis steamers to a new and shorter "overland" route.

The disruption of inland waterway traffic and the heavy emphasis placed on the development and expansion of railroads during and shortly after the Civil War took an even heavier toll on Missouri River traffic. In 1887 the Chicago and Northwestern reached Council Bluffs, Iowa and five years later the Union Pacific bridged the Missouri River at this point. As a result Omaha replaced St. Joseph as the main steamboat center for the upper river trade. During the period 1869 to 1887 the Union Pacific, the Utah Northern, the Great Northern, and the Northern Pacific railroads penetrated the upper Missouri River Basin and drained off most of the remaining traffic. A report of the St. Louis Board of Trade for 1886 reported:

"The business on this river (the Missouri) has been more affected by railroad competition, than any other river in the West. Steamboats could not compete with a railroad on either bank, and where in 1866 there were in active service seventy-one steamers, there are now but seven steamers and three tow boats, and these ply only between St. Louis and Kansas City." ⁴

Railroads were not only responsible for the stagnation of river traffic but they also retarded river development and improvement. Finally on the 13th of June, 1902, Congress

⁴ Ibid., p. 587.

passed an Act abolishing the Missouri River Commission and thus virtually abandoning the river as a commercial highway. Although Congress did authorize construction of a six foot channel from St. Louis to Kansas City in 1912 (later amended in 1927 to be extended to Sioux City), very little construction had been completed before the passage of the Pick-Sloan Plan of 1944. This plan provided for navigation studies and improvement, and authorized flood control projects. An addition to this plan in 1945 called for the construction and maintenance of a nine foot deep channel from Sioux City to the mouth of the Missouri. Although work was begun it progressed very slowly.

Soon after the disastrous flood of 1951 sufficient local and national interest in the control and stabilization of the Missouri River was aroused so that work and funding for the project proceeded at a much more rapid rate. This control and stabilization allowed for the channelization of the river. Channelization is necessary if barge traffic is to prosper on a river such as the Missouri which is continually changing and relocating its natural channels. Since the start of channelization on the upper part of the Missouri River the total tonnage has increased from less than 30,000 tons before 1957 to over one million tons in 1966, 1967, and 1969.⁵

⁵ U. S. Army Corps of Engineers, Missouri River Division, Summary of 1969 Missouri River Navigation, Omaha, Nebraska, 1970, pp. 2-5.

PHYSICAL CHARACTERISTICS OF THE MISSOURI RIVER BASIN

Approximately one-sixth of the contiguous United States, including the State of Nebraska, parts of Missouri, Kansas, Colorado, Wyoming, Montana, Minnesota, North Dakota, South Dakota, and Iowa, together with 9,715 square miles of Canada, comprises the Missouri River Basin. The Missouri River, in flowing 2,315 miles from Three Forks, Montana to its mouth a few miles above St. Louis, Missouri, is fed by thousands of streams, rivers, and lakes. These contribute to the drainage of the more than 529,350 square miles forming the Missouri River Basin.⁶

Except for the Rocky Mountains, Black Hills, and Ozark Region, the Basin is characterized by rolling or gently sloping plains and prairies. The climate varies widely throughout the Missouri River Basin. The average annual precipitation varies from six inches in the northwestern plains and twenty inches in the mountains to almost forty-four inches in the southeastern part of the Basin. Run-off amounts to an average of 2.3 inches, with individual sub-basin averages as high as 6 inches and as low as 0.4 inches. Seasonal temperatures ranging from minus sixty degrees to a plus one hundred and twenty degrees have been recorded. Temperatures of below zero to over one hundred degrees are experienced over much of the Basin each year.

⁶ Baumhoff, Richard G. The Damned Missouri Valley, (New York: Alford A. Knopf Inc., 1951), p. 11.

The differences found in the topography and climate of the Missouri River Basin are in part the causes for the variation in agriculture found in this region. As a result this area is a major supplier of wheat, corn, milo, soybeans, hay, cattle, hogs, sheep and other farm commodities.

The Basin is populated by approximately eight million people. This is a density of only sixteen persons per square mile compared to the National average of nearly sixty persons per square mile. Approximately twenty percent of these eight million people live on farms, another twenty-six percent in rural nonfarm areas, and the remaining fifty-four percent in urban communities.

PHYSICAL CHARACTERISTICS OF THE UPPER MISSOURI RIVER

The total navigable length of the Missouri River from its confluence with the Mississippi to Sioux City, Iowa is 735 miles. In this study only the upper section of the river from Rulo, Nebraska, to Sioux City, Iowa is under consideration. The distance between Rulo, which is 498 miles above the Mississippi, and Sioux City is 237 miles. Although the River and Harbor Act of March 2, 1945 called for a nine foot depth and a width of not less than 300 feet, the navigable channel for most of the 237 miles is maintained at an average depth of seven and one half to eight feet as far as Sioux City.

The Missouri River has eroded a valley thru the study area which generally lies from 100 to 300 feet below the surrounding country. In some places the river has formed sheer bluffs, while in others the sandy soils of the river valley are easily eroded and displaced. The result is a continual shifting and meandering of the river channel within a flood plain five to twenty miles wide.⁷

This continual shifting and meandering of the river channel has formed 99 major bends in the Missouri River within the study area. These bends play two major but conflicting roles. On one hand the physical character of the bends or meanders make navigation more difficult. They also help maintain the channel by causing the water to move faster as it travels through the bends. This helps to dredge material from these areas and thus improves navigation. Also to be noted are the site factors of each of the twenty-two active facilities during 1969, along with the three inactive and four closed facilities. These facilities are all located on the cutbank of the river bends.

The physical character of the river has been greatly changed with the establishment of Gavins Point, Fort Randall, Big Bend, Oahe, Garrison, and Fort Peck dams on the Missouri

⁷ Vestal, The Rivers of America, The Missouri, p. 3.

⁸ U. S. Army Engineers District, Omaha; Corps of Engineers. Project Maps, Omaha District, (Omaha, Corps of Engineers, 1963), p. B.

River from just above Sioux City to central Montana. The establishment of these dams has decreased the yearly problem of flooding on the river. This control has greatly increased the effectiveness of bank stabilization and channelization projects. These dams are also used to regulate the volume of the river flow which is kept between 34,000 and 41,000 cubic feet a second during the barging season to a winter pace of 17,000 cubic feet a second when the river is closed to navigation.

The volume of water used for navigation is controlled by the Gavins Point Dam located just above Sioux City. Because of the Gavins Point Dam, Sioux City receives enough water to open spring navigation earlier than the other ports. The official opening date for ports along the Missouri River is: Sioux City, March 13th; Omaha, March 15th; Kansas City, March 18th; and the Mississippi confluence on March 22nd. Since Sioux City is closest to Gavins Point it also feels the effect of the winter reduction in water before the other ports. Its official closing date is November 22nd, whereas Omaha closes on November 24th, Kansas City on November 27th, and the mouth is closed to navigation on December 1st.

Since 1955 the average period of time that the river has been officially open to navigation has increased from six and one half months to eight months plus ten days in 1968 and 1969, with a 10 day extension for both of these years. (Refer to Table I, on page 16.)

TABLE I

NUMBER OF MONTHS MISSOURI RIVER WAS
OFFICIALLY OPEN TO NAGIGATION 1955-1969

1955==6½	1960==7½	1965==8
1956==7	1961==6½	1966==8
1957==6½	1962==8	1967==8
1958==7	1963==8	1968==8+20 days
1959==7	1964==8	1969==8+20 days

The volume of water stored in the reservoirs from the previous year, summer rainfall and runoff, amount of water used for other projects, freezing and thawing of the river, and the combinations of these and other factors control the length of time that the river is open to navigation during any one year.

CHAPTER TWO

CARRIERS AND BARGING EQUIPMENT

CARRIERS

Of the three types of carriers and operators engaged in barge freight service: contract, private, and common; only the first two were found to be operating on the upper Missouri River during 1969. Six of the eight carriers were contract, with the remaining two being private carriers.

Common carriers offer their service to the public for the transportation and handling of almost all kinds of freight. Contract carriers handle mainly bulk commodities for a few firms. Since most of the commodities transported into and out of the study area are bulk commodities, common carriers find it hard to compete with contract carriers who do not have to comply with rates and charges published in tariffs, but who operate on individual agreements between shipper and carrier. Terms of such contracts naturally vary with the commodity and volume under consideration. The private carrier usually transports raw materials for, or the products of its parent organization. In some instances private carriers will enter into short term agreements as contract carriers where conditions warrant.¹

¹ Becht, Commodity Origin, Traffic, and Markets Accessible to Chicago Via the Illinois Waterway, p. 14.

BARGING EQUIPMENT

The carriers on this portion of our inland waterway system employ excellent transportation equipment. The average size of a towboat plying the upper Missouri River is 125 feet in length and 35 feet in width. It draws 4 to 6 feet of water and is capable of producing 1,800 to 2,800 horsepower from two diesel engines.²

Most of the towboats are equipped with two propellers, reversing-reduction gears, and multiple rudders which enable them to push a tow of four to six barges at an average speed of four miles per hour upriver and ten miles per hour downriver. While some of the towboats on the larger rivers reach speeds of ten to fifteen miles per hour from four diesel engines generating 10,000 to 12,000 horsepower, their dimensions of 170 feet in length, 58 feet in width, and 10 feet 3 inches in depth precludes their use on the upper Missouri River where an eight feet channel is available for use.³

Along with the special size and construction of towboats the employment of automatic sounding devices, electrically controlled search lights, radar, ship-to-shore radio telephones, and electric or hydraulic operated steering, has greatly increased the operational flexibility and reliability

² Information received from John Snyder, Manager of the Sioux City and New Orleans Terminals Inc., Omaha, Nebraska; personal interview, 13 January 1970.

³ Howe, Charles W., et al. Inland Waterway Transportation. (Washington: Resources for the Future, Inc., 1969), p. 10.

of the towboat and barge as a means of transportation. This increase in reliability, which has been caused by the combined improvement of barging equipment and river conditions, is reflected by the decrease in the number of barge groundings. Table II shows that the hours lost per grounding and the percent of time lost while in the study area have been decreased. Improved river conditions resulting in less severe groundings and improved equipment to free the barges once they are grounded have resulted in the sharp decrease in these figures.

TABLE II

NUMBER OF GROUNDINGS AND AVERAGE TIME LOST
PER GROUNDING 1961-1969 ⁴

YEAR	NUMBER OF GROUNDINGS	AVERAGE HOURS LOST	PERCENT OF TIME IN STUDY AREA
1961	60	1.50	2.39
1962	90	1.97	3.10
1963	111	2.04	3.40
1964	94	1.36	2.10
1965	70	1.44	2.30
1966	50	.81	1.11
1967	24	.41	.54
1968	19	.40	.36
1969	2	.08	.09

⁴ Figures received from R. Fred Thonen, Traffic Control Department, U. S. Army Corps of Engineers, Missouri River Division, Omaha, Nebraska; personal interview, 27 January 1970.

Other results in the increased reliability in equipment and improved river conditions were reflected in the increase in the total number of trips by towboats, total operating time, average draft of tows, average tons per tow, and the average number of barges per tow during the 1958-1969 period. (Refer to Table III.)

TABLE III

BARGE OPERATIONS FROM SIOUX CITY TO KANSAS CITY (1958-1969)⁵

YEAR	NUMBER OF TRIPS	TOTAL OPERATING TIME (HRS)	AVERAGE DRAFT OF TOWS	AVERAGE TONS PER TOW	AVERAGE NUMBER OF BARGES PER TOW*
1969	262	43,529	7'0"	2,390	3.2
1968	283	49,421	6'6"	2,418	3.5
1967	251	33,020	6'6"	2,649	3.2
1966	257	33,615	6'6"	2,561	3.4
1965	198	28,063	6'5"	2,288	3.1
1964	250	33,174	6'0"	1,647	3.1
1963	236	26,560	6'0"	1,516	2.7
1962	254	26,556	6'0"	1,429	2.9
1961	158	19,842	6'0"	1,767	3.6
1960	130	17,842	6'3"	2,024	3.9
1959	62	7,229	6'3"	1,894	3.7
1958	43	4,640	6'1"	1,218	2.2

* Includes empty barges.

⁵ U. S. Army Corps of Engineers. Summary of 1969 Missouri River Navigation, Missouri River Division; Omaha, Nebraska, 1970, p. 6.

Barges are constructed for one of the three following classes of commodities: 1) general cargo, 2) dry bulk, or 3) liquid bulk. The general cargo type consists of a single hopper equipped in some cases with a permanent or portable top. The dry bulk design ranges from a single hopper to the multiple hopper type with the permanent or portable top for carrying grain or other perishable goods. The liquid bulk barges are usually constructed according to the commodity they will be carrying. As a result, the greatest variety of barge designs is found in the liquid bulk category. These range from "thermos bottle" barges for chemicals, to barges with rubber lined tanks for sulphuric acid, and steam heated barges for black strap molasses. Within the study area the dry bulk is the most common type followed by the liquid bulk and the general cargo in that order.

The average dimensions of barges used within the study area are 145 feet long, by 35 feet wide and with an average depth of 10 feet. These dimensions allow for each of the barges to hold up to 1,200 tons of commodities dependent upon river conditions such as; volume of water, depth of channel, and condition of channel, i.e. stabilized or shifting. Due to the depth and other difficulties in the navigation of this portion of the river, most of the barges carry on the order of 1,050 tons to 1,150 tons.

In comparison one barge loaded with 1,100 tons equals approximately 17 forty foot boxcars, each loaded with 140,000 pounds (70 tons), or 46 semitrailer trucks, each loaded with 50,000 pounds (25 tons). Therefore a towboat pushing four loaded barges with a total weight of 4,400 tons is the equivalent of a train made up of 68 boxcars loaded to capacity or a fleet of 184 fully loaded semitrailer trucks.

A truck or a train averaging 45 miles per hour can travel a distance of 1,080 miles in one day if operated for 24 hours out of that day. Towboats on the Missouri River average four miles per hour upriver or 96 miles a day, while the downriver figures are ten miles per hour or 240 miles per day. The distance traveled and the time required for the movement of barges to and from several points within the study area to different points within our inland waterway system can be derived from Table IV, page 23. This is done by adding the time required to navigate the different sections of the rivers shown in Table IV.⁶

⁶ For example, the time required to navigate between Omaha and Chicago is derived by adding the downriver time between Omaha and St. Louis to the time required to navigate upriver from St. Louis to Chicago. This total equals seven days and three hours. The Chicago to Omaha time is derived by reversing the process. The total time required for the movement in this direction is eight days and four hours.

TABLE IV

OPERATING TIMES AND DISTANCES BETWEEN SELECTED PORTS

CITY* (from)	CITY* (to)	DISTANCES IN MILES	TIME UP RIVER**	TIME DOWN RIVER**
Sioux City	Saint Louis	728	7D + 14H	3D
Blair	Saint Louis	648	6D + 18H	2D + 17H
Omaha	Saint Louis	585	6D + 9H	2D + 13H
Neb. City	Saint Louis	562	6D	2D + 8H
Brownville	Saint Louis	535	5D + 16H	2D + 5H
Saint Louis	New Orleans	1144	11D + 19H	4D + 18H
Saint Louis	Minneapolis	853	8D + 23H	3D + 13H
Saint Louis	Chicago	439	4D + 14H	1D + 19H
Saint Louis	Ohio River	180	1D + 23H	18H
Mississippi R.	Gunterville, Ala	405	4D + 5H	1D + 16H
Mississippi R.	Louisville, Ky	377	4D	1D + 14H
Mississippi R.	Knoxville, Tenn	695	7D + 2H	2D + 22H
Mississippi R.	Cincinnati, Ohio	511	5D + 8H	2D + 3H
Mississippi R.	Pittsburgh, Pa	981	10D + 5H	4D + 2H

* Cities or junction of rivers.

** Although the speed varies on other rivers, the four miles per hour for upriver and ten miles per hour for downriver set for the Missouri River was used throughout because of the time loss found on the other rivers due to locks, river conditions, and congestion of traffic.

CHAPTER THREE

CHARACTER AND VOLUME OF TRADE FOR BARGE FACILITIES ON THE UPPER MISSOURI RIVER

CLASSIFICATION OF BARGE FACILITIES

Barge transportation has the inherent characteristic of being limited in the degree of flexibility by which it may serve an area. As a result, water carriers have encouraged the establishment of numerous terminals at strategic points along the course of each waterway. These inland waterway terminals fall into two broad categories, those operated by river carriers and terminal companies, and those operated by riparian industries.¹ On some waterways, such as the Illinois, more than three-fourths of the total tonnage for all commodities originate or terminate at the docks of industrial concerns located along that waterway. The remaining movements are handled through the docks of carrier and terminal companies.²

On the upper Missouri River the opposite holds true. Only one of the twenty-two facilities can be classified as a riparian facility, while the remaining twenty-one are

¹ A riparian industry is defined as an industry having direct water transportation.

² Becht, Commodity Origins, Traffic and Markets Accessible to Chicago Via the Illinois Waterway, p. 27.

either carrier or terminal facilities. There appears to be two main reasons for this regional difference in facility classification. The first is the location of these facilities in a predominantly agricultural region, whereas most of the eastern waterways and barge facilities serve areas which have a strong orientation toward industry. The second being that the industries located on or within practical shipping distance of the upper Missouri River are not generally large enough to ship barge-sized loads. This makes rail or truck shipment of their commodities out of the study area more economical.

REASONS FOR FACILITY LOCATION

Since most of the water transportation is not confined to port-to-port traffic, the location of facilities within the study area is of prime importance. While cheap barge transportation influenced the location of most of the existing facilities, two other factors were also influential in the location of facilities within the study area. These factors appear to be the proximity of an available site near the center of the proposed service area, and the availability of rail and/or truck transport routes within the proposed service area. Other factors mentioned were, the location in or near a population center, the usage of water in plant processes, and the relocation of the existing plant in order to gain barge service. (Refer to Table V, page 26.)

TABLE V

LOCATION FACTORS FOR THE TWENTY-TWO FACILITIES*

	NEBRASKA CITY	OMAHA	SIOUX CITY	TOTAL
Cheap barge transportation.	4	10	5	19
Connection with rail or truck transport routes.	6	11	5	22
Near the center of the proposed service area.	6	8	4	18
Facility converted or relocated to use barge services.	2	2	1	5
Located in or near a population center.	0	1	0	1
Usage of water in plant processes.	0	1	0	1

* Each company asked to list three.

LOCATION OF BARGE FACILITIES

Of the twenty-two facilities located within the study area which shipped or received commodities by barge during 1969, five were located in the Sioux City region, eleven in the Omaha region, and six in the Nebraska City region. Not included in these figures are the Municipal Docks of Sioux City, Plattsmouth, and Nebraska City. These facilities did not ship or receive commodities during 1969. Eight of the facilities were engaged in the handling of inbound commodities, seven in the shipment of commodities out of the study area, and seven dealt in both inbound and outbound commodities. (Refer to Table VI, page 27.)

TABLE VI

NUMBER OF FACILITIES AND DIRECTION
OF COMMODITY FLOW BY REGION

	NEBRASKA CITY	OMAHA	SIOUX CITY	TOTAL
INBOUND	0	6	2	8
OUTBOUND	4	2	1	7
INBOUND AND OUTBOUND	2	3	2	7
TOTAL	6	11	5	22

FACILITIES HANDLING ONLY INBOUND COMMODITIES

During 1969 six of the eight facilities engaged in the handling of only inbound barge freight were concentrated at Omaha. The remaining two facilities, which handled nearly 42,000 tons of anhydrous ammonia, were found at Blair, Nebraska which is located in the Sioux City region. The six facilities located at Omaha handled a total of six different commodities during 1969. (Refer to Table VII, page 28.) Together, these eight facilities accounted for approximately 447,000 tons of barge freight. This figure amounted to 41.1 percent of the total 1,087,099 tons carried by barge for the entire study area, and 62.7 percent of the total inbound commodities for 1969.

TABLE VIIFACILITIES IN THE OMAHA REGION HANDLING ONLY INBOUND GOODS³

COMMODITY	NUMBER OF FACILITIES HANDLING EACH COMMODITY	VOLUME IN TONS
Cement	1	128,618
Salt	3	98,000
Dry Fertilizer	3	91,000
Steel	1	38,000
Molasses	1	35,000
Paper	1	14,580
TOTAL	---	405,198

FACILITIES HANDLING ONLY OUTBOUND COMMODITIES

Four of the seven facilities engaged in the handling of only outbound traffic were located in the Nebraska City region, two were found in the Omaha region, and one in the Sioux City region. Five of these facilities shipped grain (wheat, corn, milo, or soybeans) downriver, with the remaining two facilities handling alfalfa pellets. The three facilities in the Nebraska City region handling grain (two of which were located in Nebraska City and the other at Rock Bluff) shipped a total of 75,000 tons of grain downriver.

³ Figures derived by combining information obtained from personal interviews, company records, and the Summary of 1969 Missouri River Navigation.

The two facilities in Omaha shipped nearly 29,000 tons of grain. A combined total of approximately 31,000 tons of alfalfa pellets were shipped from the other two facilities, one located at Blair and the other at Nebraska City. These seven facilities combined to ship a total of nearly 135,000 tons of commodities out of the study area during 1969. This amounted to 12.4 percent of the total tonnage and 36.1 percent of the outbound tonnage for the study area.

FACILITIES HANDLING BOTH INBOUND AND OUTBOUND COMMODITIES

Two of the seven facilities engaged in the handling of both inbound and outbound commodities are located in Nebraska City, three in the Omaha region (two in Omaha and one in Council Bluffs), and two in Sioux City. These seven facilities handled a total of ten different commodities. Seven of these commodities were shipped upriver, two were sent downriver, and one was carried in both directions. (Refer to Table VIII, page 30.) Approximately 265,788 tons of commodities or 24.5 percent of the total tonnage was carried upriver to these facilities, while 239,113 tons or 22.6 percent was shipped downriver by these facilities. Together these two figures represent 504,901 tons or 46.5 percent of the total tonnage carried. The inbound tonnage figure represented 37.3 percent of the total inbound tonnage figure, while the outbound figure equaled 63.7 percent of the total outbound tonnage.

TABLE VIII

FACILITIES HANDLING BOTH INBOUND AND OUTBOUND COMMODITIES

INBOUND COMMODITIES	NUMBER OF FACILITIES HANDLING COMMODITY	VOLUME IN TONS
Molasses	4	98,000
Dry Fertilizer	3	70,000
Salt	1	48,384
Chemicals	1	15,258
Liquid Fertilizer	1	15,000
Feed Supplement	1	12,000
Steel	1	6,691
Binder Twine	1	475
<u>TOTAL</u>	---	265,788

OUTBOUND COMMODITIES	NUMBER OF FACILITIES HANDLING COMMODITY	VOLUME IN TONS
Grain	3	114,500
Tallow	4	74,868
Chemicals	1	49,745
<u>TOTAL</u>	---	239,113
<u>TOTAL FOR BOTH DIRECTIONS</u>		504,901

CHARACTER AND VOLUME OF COMMODITIES HANDLED

Ten commodities comprised a large portion of the tonnage carried on the upper Missouri River. The principal commodities handled by the waterway in 1969 in order of their tonnage were: grain, dry fertilizer, salt, molasses, cement, tallow, chemicals, liquid fertilizer, steel, and alfalfa pellets. A number of commodities other than these were also shipped but their combined tonnage amounted to only 2.5 percent of the total 1,087,099 tons of commodities carried during 1969. (Refer to Table IX.)

TABLE IX

PRINCIPAL COMMODITIES CARRIED ON THE UPPER MISSOURI RIVER, 1969⁴

<u>COMMODITY</u>	<u>NET TONS</u>	<u>PERCENT OF TOTAL</u>
Grain	218,500	20.1
Dry Fertilizer	161,000	14.8
Salt	146,364	13.5
Molasses	133,000	12.2
Cement	128,618	11.8
Tallow	74,868	6.9
Chemicals	65,003	6.0
Liquid Fertilizer	57,000	5.2
Steel	44,691	4.1
Alfalfa Pellets	31,000	2.9
All Others	27,055	2.5
<u>TOTAL</u>	<u>1,087,099</u>	<u>100.0</u>

⁴ U. S. Army Corps of Engineers, Summary of 1969 Missouri River Navigation, pp. 2-5.

The total inbound tonnage for the entire study area equaled approximately 713,000 tons or 65.6 percent of the total tonnage during 1969, while outbound totals were 374,000 tons or 34.4 percent. The total tonnage of 1,087,099 tons represented a peak in barge traffic for the upper Missouri River. (Refer to Table X.)

TABLE X

BARGE TRAFFIC MOVING WITHIN THE STUDY AREA 1957-69⁵

YEAR	INBOUND	PERCENT INBOUND	OUTBOUND	PERCENT OUTBOUND	TOTAL
1957	33,734	74.3	11,681	25.7	45,415
1958	39,714	39.6	60,507	60.4	100,221
1959	53,898	24.5	165,687	75.5	219,585
1960	69,406	14.5	398,870	85.5	468,276
1961	100,199	20.3	394,238	79.7	494,437
1962	134,668	18.4	598,176	81.6	732,844
1963	165,859	23.2	550,009	76.8	715,868
1964	233,812	28.4	589,714	71.6	823,526
1965	323,110	42.7	430,739	57.3	753,849
1966	477,974	46.7	545,492	53.3	1,023,466
1967	588,424	56.5	454,975	43.5	1,043,399
1968	665,682	69.4	293,533	30.6	959,215
1969	712,986	65.6	374,113	34.4	1,087,099
TOTAL	3,599,446	42.4	4,857,766	57.6	8,457,185

⁵ Figures received from R. Fred Thonen, Traffic Control Department, U.S. Army Corps of Engineers, Missouri River Division, Omaha, Nebraska; personal interview, 27 January 1970.

Since 1960 there has been a general increase in the percent of inbound commodities as compared to outbound commodities, with inbound commodities accounting for an ever larger percentage over outbound commodities for each year since 1967. The reason for this marked change appears largely to have been competition from railways in the export of grain, which has decreased the total volume of grain exported by barge from this region. This factor, coupled with the rapid development of eighteen of the twenty-two facilities since 1960, thirteen of the eighteen being oriented toward inbound movements, seems to indicate that inbound commodities will continue to surpass outbound commodities in total tonnage on the upper Missouri River. The large existing inbound commodity markets, the general improvement of the navigability of the river, and the improvement of barging equipment also favors the increase in general river traffic volume.

CHAPTER FOUR

INBOUND COMMODITIES

POINTS OF DESTINATION

As previously stated, fifteen of the twenty-two facilities handled inbound commodities during 1969. Eight of these facilities handled only inbound commodities while the remaining seven dealt in both inbound and outbound commodities. Two of the fifteen facilities were located in the Nebraska City region, nine in the Omaha region, and four in the Sioux City region. (Refer to Table XI, page 35.)

As shown in Table XI, dry fertilizer, salt and molasses were each handled by five facilities. Three facilities received liquid fertilizer, while two were handling steel. Feed supplement, cement, chemicals, newsprint, and binder twine were each handled by only one facility. Five of these commodities; dry fertilizer, salt, molasses, cement, and liquid fertilizer accounted for 87.3 percent of the total 712,986 tons of inbound commodities during 1969. The remaining five commodities; steel, chemicals, newsprint, feed supplement, and binder twine made up the remaining 12.7 percent. The ranking of inbound commodities and their percentage of the inbound total is shown in Table XII, page 36.

TABLE XI

NAME AND LOCATION OF FACILITIES, AND COMMODITIES HANDLED**

NEBRASKA CITY REGION

<u>FACILITY</u>	<u>LOCATION</u>	<u>COMMODITIES AS HANDLED</u>
Steinhart Terminal Warehouse	Nebraska City	Dry Fertilizer and Salt
Steinhart Terminal Bulk Plant	Nebraska City	Molasses

OMAHA REGION

<u>FACILITY</u>	<u>LOCATION</u>	<u>COMMODITIES AS HANDLED</u>
Allied Chemical Corporation	Omaha	Chemicals
*National Molasses	Omaha	Molasses
*Morton Salt	Omaha	Salt
Peavey Company of Omaha	Council Bluffs	Feed Supplement
*Farmland Industries	Council Bluffs	Dry Fertilizer and Salt
Cargill Molasses Terminal	Omaha	Dry Fertilizer, Steel, and Newsprint
*Cargo Carriers Inc.	Omaha	Dry Fertilizer and Salt
*Missouri Portland Cement Company	Omaha	Cement

SIOUX CITY REGION

<u>FACILITY</u>	<u>LOCATION</u>	<u>COMMODITIES AS HANDLED</u>
*Agrico Chemical Company	Blair	Liquid Fertilizer
*Gulf Oil Corporation	Blair	Liquid Fertilizer
Big Soo Terminal	Sioux City	Dry Fertilizer, Salt, Molasses, Binder Twine, and Steel
Kay Dee Feed Company	Sioux City	Molasses, and Liquid Fertilizer

**Refer to Map I, page 2.

*Handled only inbound commodities.

TABLE XII

INBOUND COMMODITIES CARRIED ON THE UPPER MISSOURI RIVER, 1969

<u>COMMODITY</u>	<u>NET TONS</u>	<u>PERCENT OF INBOUND TOTAL</u>
Dry Fertilizer	161,000	22.6
Salt	146,364	20.1
Molasses	133,000	18.6
Cement	128,618	18.0
Liquid Fertilizer	57,000	8.0
Steel	44,691	6.2
Chemicals	15,258	2.1
Newsprint	14,580	2.0
Feed Supplement	12,000	1.7
Binder Twine	475	.7
<u>TOTAL</u>	<u>712,986</u>	<u>100.0</u>

SUPPLY AREAS

Four areas supplied all of the commodities destined for the study area during 1969. These areas were the Gulf Coast, lower Missouri River, Ohio River and the lower Mississippi River.

Some 509,364 tons of the total 712,986 tons of inbound commodities originated in the Gulf Coastal area of the United States or entered the United States through a Gulf Coastal port. The commodities included were: 161,000 tons of dry fertilizer; 146,364 tons of salt; 133,000 tons of molasses; 57,000 tons of liquid fertilizer; and 12,000 tons of feed supplement. This amounted to 71 percent of the inbound commodities.

The next largest shipping area for inbound commodities was the lower Missouri River, which was the place of origin for 128,618 tons of cement. This total represented 18 percent of the inbound commodities brought into the study area.

The Ohio River Basin supplied the major portion of the 44,691 tons of steel, all of the 14,580 tons of newsprint, and 475 tons of binder twine. The total tonnage of nearly 60,000 tons from this area accounted for 8.9 percent of the inbound tonnage.

The lower Mississippi River was the place of origin for 15,258 tons of chemicals. This figure represented 2.1 percent of the commodities moving into the study area.

It should be noted that the Gulf Coastal area shipped mostly raw materials or commodities oriented toward agriculture, while the remaining regions supplied mostly manufactured or partially refined materials.

DRY FERTILIZER

Phosphates and nitrates composed the major portion of dry fertilizer shipped into the study area. These fertilizers were shipped from Florida, eastern Texas, and Louisiana via the Intracoastal Waterway or via rail into the New Orleans area where they are transferred into barges for shipment into the study area.

Dry fertilizers are shipped out of New Orleans in bulk form. They are loaded by crane, belt conveyors and gravity bins into dry bulk barges. Each barge is loaded with approximately 1,100 tons of fertilizer. These barges are then joined by other barges heading up the Mississippi River into the Saint Louis area where they are placed into tows destined for facilities along the Missouri River.

Conveyor belts or vacuum pipes are used to unload the major portion of the dry fertilizer once it reaches one of the barge facilities in the study area. Most of the fertilizer is placed in bins or storage areas inside of a warehouse, although a small portion is stored outside for short periods of time during the peak late spring-early summer period.

Although bulk storage and shipment of dry fertilizer predominates, most of the facilities are being converted in order that the mixing and sacking of fertilizers can take place at the barge facility. This conversion has been brought about by the increased demands for mixed fertilizers. The extension of services by the barge facilities to include not only warehousing but the mixing and sacking of goods while being warehoused is one of the most important services provided by a good barge terminal. As Becht pointed out, many shippers use the waterways only because the storage facilities thus provided are advantageous to their operations. Large storage spaces enable the terminals to provide warehousing services at a convenient transshipping point, thereby extending the intransit storage period.¹

The mixing and sacking of goods at the barge facility thereby eliminates the need of mixing and sacking equipment by the retailer, thus saving the retailer money on the purchase of equipment, and allowing him to have more storage space which would otherwise be filled by machinery. This coupled with the practice of warehousing by the barge facility enables the retailer lacking storage space to use low-rent barge transportation and still be able to receive uniformly small consignments of material at their plants.²

¹ Becht, Commodity Origins, Traffic, and Markets Accessible to Chicago Via The Illinois Waterway, p. 34.

² Information received from John Snyder; Manager Steinhart Terminals, Omaha Municipal Docks; Omaha, Nebraska, personal interview, 22 January 1970.

While 161,000 tons of dry fertilizer were received at the facilities during 1969, a reported 186,000 tons were shipped out of the facilities to the points shown on Map II, part A, page 41. The difference in figures was due to the shipment of 25,000 tons of stored fertilizer in addition to the 161,000 tons received during the 1969 shipping period.

The approximations given by the different facilities as to the mode of transportation used to ship dry fertilizer to the distributors and users are found in Table XIII.

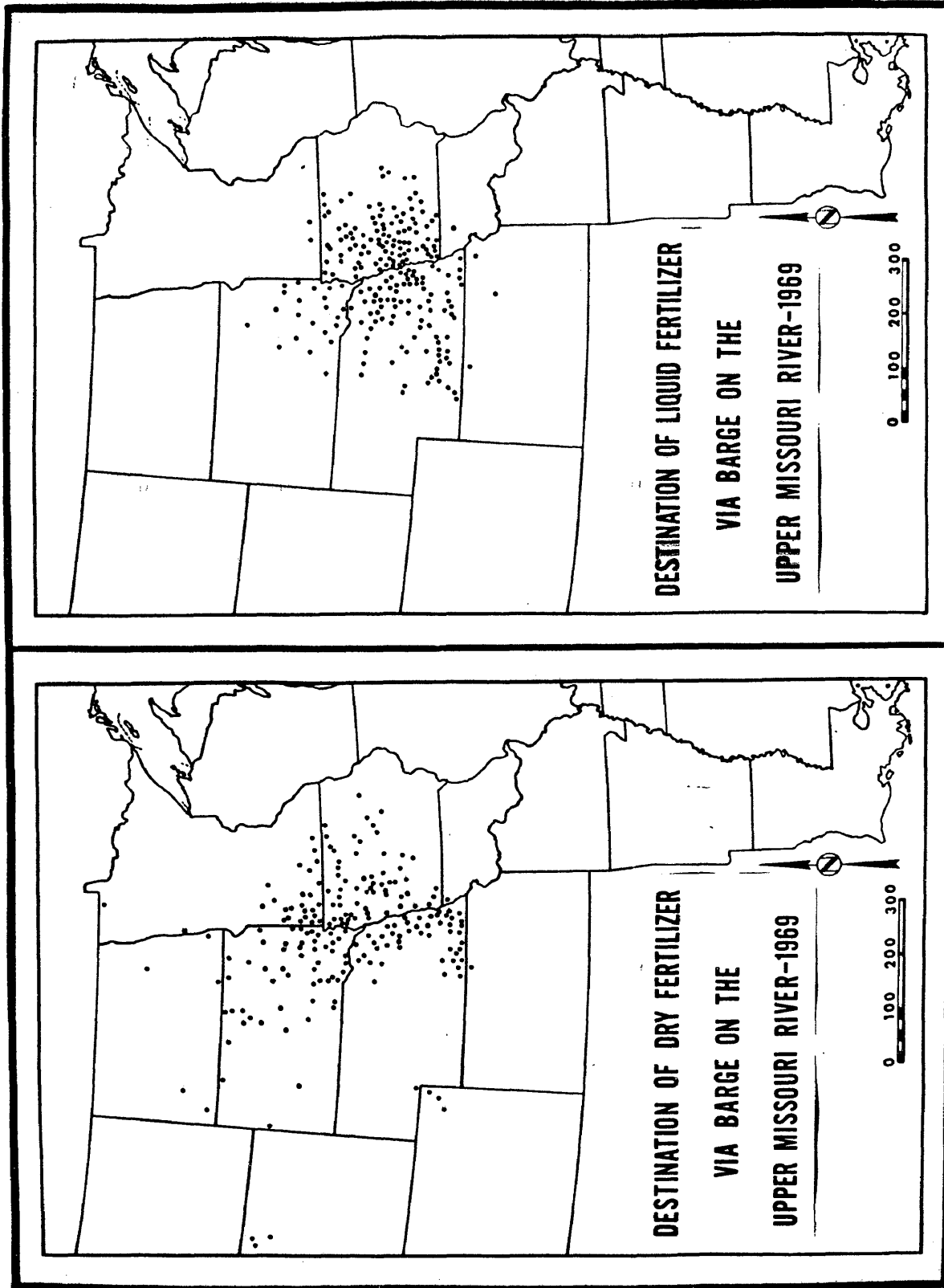
TABLE XIII

MODE OF TRANSPORTATION FOR DRY FERTILIZER
FROM BARGE FACILITIES, IN PERCENTS

NAME	LOCATION	RAIL	TRUCK
Steinhart Terminal Warehouse	Nebraska City	70	30
Farmland Industries	Council Bluffs	60	40
Omaha Municipal Dock	Omaha	75	25
Cargo Carriers Inc.	Omaha	50	50
Big Soo Terminal	Sioux City	60	40

When these approximations are coupled with the tonnages that each facility shipped during the 1969 season one finds that 125,000 tons (67.2 percent) were shipped by rail and the remaining 61,000 tons (32.8 percent) by truck.

Approximately 10 percent (12,000 tons) of the railed and 40 percent (24,000 tons) of the trucked fertilizer was sacked. This represented almost 19 percent (36,000 tons) of



Part B

MAP II

Part A

the total fertilizer shipped during the 1969 season. Although the recent growth in sacked fertilizer has been in trucked fertilizer, it is proposed by some facility operators that sacked rail fertilizer will soon overtake the sacked truck fertilizer in volume. It is generally felt that as more distributors realize the convenience of warehousing and sacking, coupled with the growing demand for a wider variety of mixed dry fertilizers, that many of those distributors now handling large shipments of bulk rail fertilizers will change to shipments of sacked rail fertilizers.³

DISTRIBUTION OF DRY FERTILIZER

The destination of dry fertilizer as shown on Map II, part A, page 41, represents the receiving points for dry fertilizer during the study period. Each dot represents one location which received dry fertilizer. No numerical value or representation was given as to the amount of fertilizer each point represents. In other words, a location receiving half a truck load of dry fertilizer is represented by a dot, just as is a location which received nine train car loads. (This method of representation is also used on the remaining maps.)

³ Information received from Fred Tinker; Manager, Big Soo Terminal; Sioux City, Iowa, personal interview, 21 March 1970.

Although this does not give a true representation as to the amount of a commodity a particular area might receive, it does give the location of the users and distributors of that commodity. Since the distribution areas of the distributors often overlap, this method was chosen over the method just mentioned because this overlapping would distort a numerical or value representation.

The area covered by the distribution of barged dry fertilizer can be divided into three main regions, as to the areas served by the different barge facilities. The first region is that area served by the facility located in Nebraska City. The second region is the area served by barge facilities located in Omaha and Council Bluffs, and the third region is that area which is served by the Sioux City facility.

The Nebraska City region comprised that area west of the Missouri River for 150 miles and extending from the Kansas-Nebraska boundary to approximately 75 miles north of that line. (Refer to Map II, part A, page 41.) The existing highway and rail systems in this area facilitated the movement of dry fertilizer from Nebraska City even though this city is located at the eastern edge of its market area.

Although the Nebraska City region is located closest to the Gulf Coastal area and the influence of direct rail-shipped fertilizer, it has established itself at the expense of this direct rail-shipped fertilizer. The barge facility

located at Nebraska City along with the facilities located at St. Joseph and Kansas City, which service the northeastern and northcentral regions of Kansas, have competed successfully with railed fertilizer due to the low costs of barge transportation.⁴

The majority of the dry fertilizer shipped into the Nebraska City area is used on corn fields with the fertilization of soybeans, milo, and wheat following in that order. In the last five years as more corn and wheat land was planted in soybeans and milo, the increase of fertilizer for milo and soybeans has jumped. At the same time fertilizer used for corn and wheat has shown only slight gains.⁵

In Nebraska, the Omaha-Council Bluffs region runs from approximately twenty miles south of Omaha to within fifty or sixty miles of Sioux City, and west of the Missouri River for a distance of about seventy-five miles. In Iowa the region includes much of the southwestern and westcentral sections of that state, and extends to several points 200 miles east of Council Bluffs.

The confinement of the usage of dry fertilizer north of Omaha is caused in part by only a fair east-west rail and road network through this region. More important than the lack of good east-west transportation in this area is

⁴ Information received from John Snyder; Manager, Steinhart Terminals, Omaha Municipal Docks; Omaha, Nebraska, personal interview, 22 January 1970.

⁵ Ibid.

the decrease in precipitation from east to west, coupled with changes in topography and soils. The decrease in precipitation, coupled with the encroachment from the west of the Sand Hills, results in less land being used for the production of corn, milo, and soybeans and an overall increase in land being used for the production of wheat in the east and hay to the west.

The extension of the Omaha-Council Bluffs dry fertilizer region into central and eastern Iowa is the result of four factors. First, there is a large need for dry fertilizer in the production of corn. Second, the facilities in Omaha-Council Bluffs have equipment for the packaging of special fertilizers needed to obtain the high yields per acre. Thirdly, the rail and highway transport routes, with emphasis on the interstate system, allows for cheaper and faster transportation of dry fertilizer into central Iowa. A forth reason is the fact that few facilities along the Mississippi River in eastern Iowa or Western Illinois ship dry fertilizer into this section of Iowa.

The market area for the facility in Sioux City included northeastern Nebraska, northwest and northcentral Iowa, a section of Minnesota, west and south of the Minnesota River, South Dakota, east of the Missouri River, along with scattered points in North Dakota and western South Dakota. A good radiating network of roads and railroads from Sioux City allows for the easy movement of dry fertilizer into the market area.

Although competition from the Omaha facilities has confined Sioux City distribution on the south, the facility at Sioux City has, with the exception of some competition from the Minneapolis-St. Paul area, open territory to the west and north into North and South Dakota. It is the wish of terminal operators at Sioux City to move into the wheat region of eastern Montana within five years. They believe that they can accomplish this due to cheaper rates and charges, good connections with rail and truck routes, and the limited amount of competition that they would have in this area.⁶

LIQUID FERTILIZER

Ammonia nitrate and anhydrous ammonia were the only types of liquid fertilizers carried into the study area by barge in 1969. The ammonia nitrate originated from plants in Arkansas and Louisiana as did the anhydrous ammonia. Both of these fertilizers are loaded by means of pipe lines into "thermos bottle" barges. Each barge is loaded with approximately 1,200 tons of fertilizer.

Although both are shipped in "thermos bottle" barges the ammonia nitrate doesn't require maintenance at a temperature of minus 28 degrees as does anhydrous ammonia. Below a temperature of minus 28 degrees, anhydrous ammonia is a

⁶ Information received from Fred Tinker; Manager, Big Soo Terminal; Sioux City, Iowa, personal interview, 21 March 1970.

liquid which is stable and easy to pump. Above a minus 28 degrees, anhydrous ammonia turns into an unstable gas which is difficult and hazardous to pump. Therefore, during river transportation, loading and unloading, anhydrous ammonia is kept as close as possible to a temperature of a minus 28 degrees or below.

Damage caused to stationary pumping equipment by annual flooding and ice along the upper Missouri River makes it more economical for the "thermos bottle" barges to be equipped with their own pumps. The crew of the tow can therefore maintain and make repairs to the pumps during the transportation period.

Once delivered to the barge facilities the liquid fertilizer is stored in bulk tanks ranging in size from 15,000 to 35,000 ton capacities. An integral part in the storage of liquid fertilizer is the number of safety devices that are employed. Double lined tanks, safety valves and gauges, by-passes and over-load equipment, and a retaining pond around the main storage tanks are customary. Just as many if not more safety devices and equipment are used in the yards where the truck and rail cars are loaded. Mainly due to this need for safety equipment in the handling of liquid fertilizers, especially anhydrous ammonia, these facilities are kept in better working order than any of the other barge facilities in the study area.

A reported 57,000 tons of liquid fertilizer reached the facilities during the study period. The same facilities shipped out an estimated 63,000 tons to the points of Map II, part B, page 41. This difference was due to the shipment of 6,000 tons of liquid fertilizer stored from the previous year and/or the shipment of liquid fertilizer received by other means of transportation.⁷

The approximations as to the mode of transportation used to ship liquid fertilizer to the distributors and users are found in Table XIV.

TABLE XIV

MODE OF TRANSPORTATION FOR LIQUID FERTILIZER
FROM BARGE FACILITIES, BY PERCENTS

NAME	LOCATION	TRAIN	TRUCK
Agrico Chemical Company	Blair	5	95
Gulf Oil Corporation	Blair	35	65
Kay Dee Feed Company	Sioux City	15	85

Applying these approximations to the tonnages that each facility shipped during the study period, yields a total of 11,850 tons (20.8 percent) shipped by rail, leaving the remaining 45,150 tons (79.2 percent) for transportation by truck.

⁷ Kay Dee Feed Company received eighty percent of its liquid fertilizer by rail, while Gulf Oil Corporation received five percent by rail.

DISTRIBUTION OF LIQUID FERTILIZER

Map II, part B, page 41 shows the distribution of receiving points for liquid fertilizer during 1969. As stated earlier in the discussion of dry fertilizer, each of the dots represents one receiving point. Also as before no value representation has been given.

Unlike dry fertilizers, the distribution of liquid fertilizers is more homogenous throughout. There are no large recognizable regions which could be picked out for any of the three facilities, because of the overlapping of their distribution areas. The Gulf Oil facility did deliver most of the liquid fertilizer to the Sand Hill region of Nebraska. as can be picked out by the string of dots appearing in that region on Map II, part B, page 41. This is due to the usage of an existing rail line through this region.

The concentration of receiving points in the Platte River Valley of southcentral Nebraska is due to the usage of the interstate highway system by the Gulf and Agrico facilities for the delivery of anhydrous ammonia for usage on corn, hay, and alfalfa fields. Rails accounted for an estimated thirty percent of the liquid fertilizer brought into the Platte River Valley from these two facilities. In Iowa, the relatively dense road network resulted in a large number of receiving points from all three of the facilities.⁸

⁸ Agrico has a liquid fertilizer facility at Davenport, Iowa which ships to most of eastern Iowa.

Although the usage of dry fertilizer was nearly three times as great as liquid fertilizer, 186,000 tons to 63,000 tons, the barge facility operators expect to see this ratio decrease to 2:1 by 1975. The projected 1975 figure for dry fertilizer is 250,000 tons and that for liquid fertilizer is 125,000 tons.⁹ While dry fertilizers are increasing at a rapid rate due to the variations offered by sacked fertilizer, liquid fertilizer will be increasing at even a faster rate due to the introduction of different kinds of liquid fertilizers to more points along the upper Missouri River.¹⁰

SALT

Louisiana was the lone supplier of salt moving into the study area during 1969. Although Texas had been a supplier of salt to the upper Missouri River barge traffic in recent years, it did not contribute any salt as reported by the facility operators for 1969.

Salt was loaded by means of conveyor belts and cranes from mines and other stockpile points along the Gulf Coast of Louisiana into dry bulk barges. In the past salt was shipped upriver pre-graded. The trend now is to ship "approx-

⁹ Information received from John Snyder; Manager, Steinhart Terminal, Omaha Municipal Docks; Omaha, Nebraska, personal interview, 22 January 1970.

¹⁰ Information received from Milton Clifton; Manager, Gul Oil Corporation; Blair, Nebraska, personal interview, 21 March 1971.

imate mixed loads" to the facilities.¹¹ This means that the barge facilities in the study area have to grade and separate the salt before it is shipped to the users and distributors. This is accomplished through the use of a simple system of rotating wire drums, which allows the finer particles to drop out first, then the medium size particles, and finally the course size particles. From the graded or separated stage the salt is then shipped out in either bulk or sacked form.¹²

In excess of 175,000 tons of salt were shipped out of the barge facilities to users and distributors, while only 146,000 tons were received by the barge facilities. This difference of 30,000 tons of salt was made up from salt stockpiled during the 1968 shipping season. This drain of 30,000 tons of salt had to be made up before the end of the 1970 shipping season, if not, there would have been a shortage of salt for the first four months of 1971. If this would have occurred, it would have meant that salt from central Kansas would have been moved into the area by rail to meet the shortage.

The approximations given by the different facilities as to the mode of transportation used to ship salt to the users and distributors are found in Table XV, page 52.

¹¹ An "approximate mixed load" is when the approximate percentage of the needed grades of salt are loaded into one barge.

¹² Information received from Ken Rota; Manager, Salt Division, Cargo Carriers Inc.; Omaha, Nebraska, personal interview 19 March 1970.

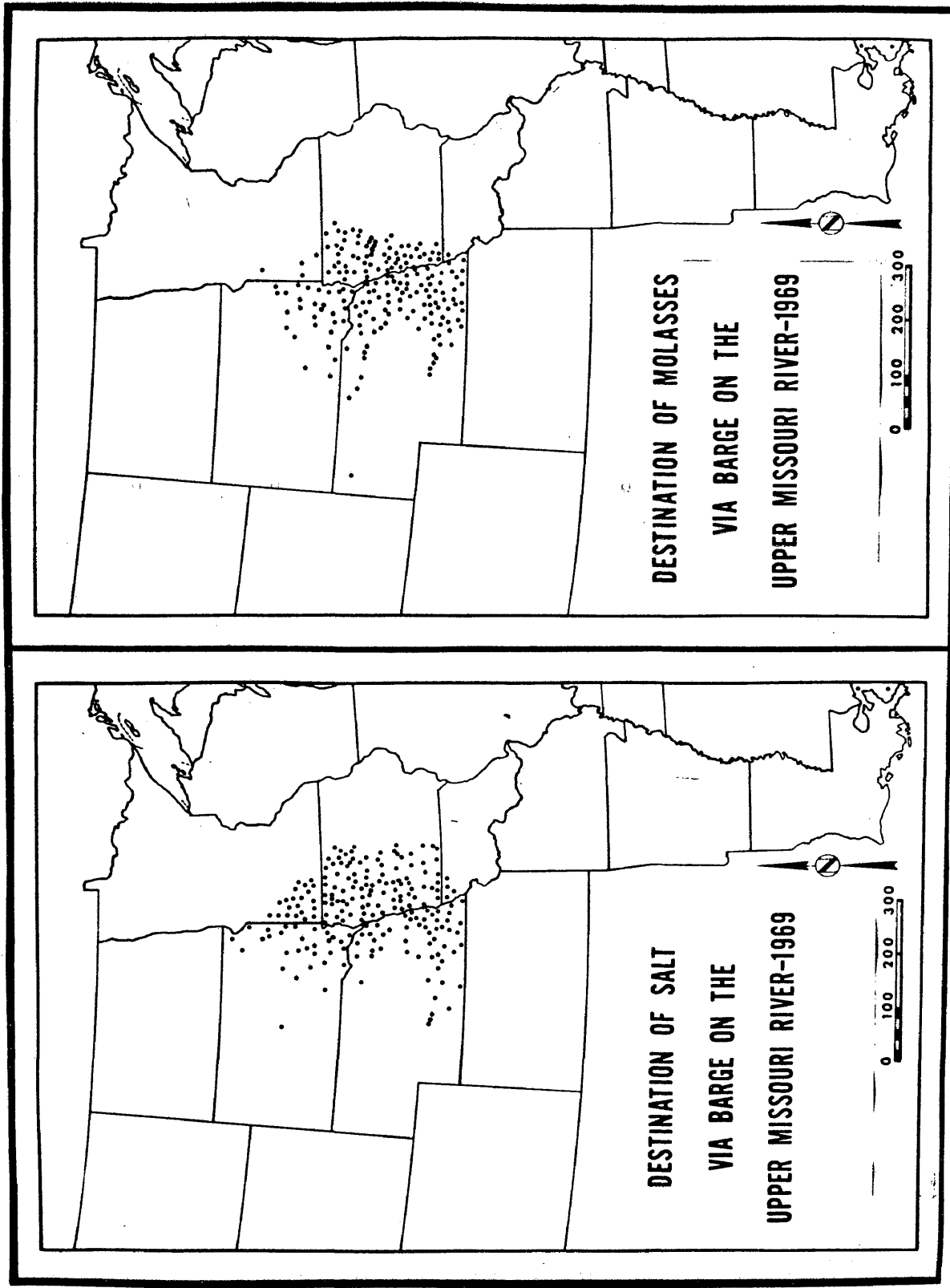
TABLE XV
 MODE OF TRANSPORTATION FOR SALT
 FROM BARGE FACILITIES, BY PERCENT

NAME	LOCATION	TRAIN	TRUCK
Steinhart Terminal Warehouse	Nebraska City	10	90
Morton Salt Company	Omaha	0	100
Farmland Industries	Council Bluffs	20	80
Cargo Carriers Inc.	Omaha	0	100
Big Soo Terminal	Sioux City	10	90

These approximations coupled with the tonnage figures for salt that each of the facilities shipped during 1969 yielded figures of 22,500 tons (12.8 percent) being shipped by rail, and 153,500 tons (87.2 percent) by truck. Sacked salt made up 15 percent (3,500 tons) of the railed salt, and 15 percent (20,000 tons) of the trucked salt. Sacked salt therefore represented 15 percent (23,500 tons) of the total volume shipped from the facilities. Most of the sacked salt was delivered to either water softening dealers or to agricultural feed and supplement distributors. The majority of the bulk salt went to hide processors, meat packing industries, highway and street ice control, or road stabilization.

DISTRIBUTION OF SALT

The destination of salt (Map III, part A, page 53,) is controlled largely by regions set up by the salt companies.



Part A MAP III Part B

Cargill operates the salt distributorship of the two largest salt terminals; the facilities at Cargo Carriers and Big Soo. This company has limited these two facilities to the following area; the western half of Iowa; Minnesota, west and south of the Minnesota River; approximately 150 miles west of the Missouri River in Nebraska; and all of North and South Dakota which they can service for a substantial profit.¹³

Two of the remaining companies compete with Cargill within the limits just mentioned. These are Morton Salt and Farmland Industries of Omaha. Morton salt is limited mainly to the Omaha area with approximately 50 percent of its salt being used for street clearance. Packing houses use 35 percent and the remaining 15 percent goes to agricultural feed distributors and water softening dealers. Farmland Industries sends about 30 percent of its salt to the Omaha-Council Bluffs area for street clearance, 15-20 percent to packing houses and hide processors, and the remaining 50-55 percent reaches the agricultural feed distributors or small towns for usage in street clearance.

The remaining facility, Steinhart Terminal Warehouse of Nebraska City, controls to a large degree southeastern Nebraska, and the Platte Valley as far west as the city of North Platte. A small portion of Steinhart goes into northwestern

¹³ Information received from Ken Rota; Manager, Salt Division, Cargo Carriers Inc.; Omaha, Nebraska, personal interview, 26 March 1970.

Missouri. Approximately twenty percent stays in Nebraska City for street and road clearance, and the remainder is shipped to either Lincoln or to small towns in southeastern Nebraska for street clearance or agricultural purposes.

As mentioned, the Cargill facilities in Omaha and Sioux City are the largest in the study area. The regional limitations placed on these facilities have not hurt their growth. As pointed out to the writer, these limits are based by the company on operational costs, salt prices, and margin of profit, and as a result the regional limits placed on the facilities is their best operating area. Outside of this area, the company feels that they are losing money and will not compete.¹⁴ To be noted is the fact that Eastern Iowa, and the remaining area in Minnesota is controlled by Cargill facilities located on the Mississippi River. Therefore they would be competing with their own facilities in these areas. To the west of their established line in Nebraska they would compete with railed salt out of Kansas, but since their profits would be smaller they concentrate on eastern Nebraska as defined above.

Salt leaving the Cargill facilities is used for basically the same purposes as that leaving the other three facilities. The Big Soo sends 25 percent to Sioux City for street and road

¹⁴ Information received from Fred Tinker; Manager, Big Soo Terminal; Sioux City, Iowa, personal interview, 29 December 1970.

clearance, 25 percent to meat packers and processors in Sioux City, 15 percent to agricultural feed distributors, and the remaining 35 percent to small towns and road departments for ice control. Cargo Carriers sent approximately 35 percent to the packing houses in Omaha, 55 percent to the Omaha-Council Bluffs area for road clearance, and the remaining 10 percent to either agricultural feed distributors or to road departments for road clearance or stabilization.

MOLASSES

All of the molasses moved by barge into the study area during 1969 came from either Louisiana or Latin America. The overseas shipments of cane molasses is either transhipped directly into barges at New Orleans, or loaded after further processing in refineries found in the vicinity of that city. The imported molasses along with domestic cane molasses is loaded into specially constructed steam heated "thermos bottle" barges by a system of heated pipes.

Upon arrival in the study area the molasses is unloaded from the barges by pumps which are located on the barges. The molasses is pumped into specially constructed storage tanks which can be steam heated. The heating of the molasses in these storage tanks allows for easier loading of the molasses into either rail or truck tank units when being shipped from

the facilities. When being heated a small portion of the molasses is allowed to flow into the heating section of the storage tank. This allows for the heating of a specific amount of molasses instead of the whole tank.

When unloaded from the barges the molasses is at a consistancy of 85 brix.¹⁵ Before being shipped to distributors and users the molasses is diluted to 79.5 brix with the addition of water. This process takes place as the molasses is being heated for loading, since if diluted while in storage it would take more storage space.

Map III, part B, page 53, shows the points of distribution for molasses during 1969. These points received some 102,000 tons of molasses during this period, while the barge facilities unloaded 133,000 tons of molasses. This additional 31,000 tons was placed in storage at the barge facilities. The reason for the surplus of barge-shipped molasses was the growing demand by users in the study area for a larger supply of molasses for usage in late winter and early spring.¹⁶ Therefore, while the river was still open for traffic, molasses was brought upriver for storage at the barge facilities until needed. This has necessitated the building of new storage tanks or the overhauling and repairing of several of the older facilities in recent years.

¹⁵ "Brix" is a term used to describe the amount or percentage of solids found in molasses.

¹⁶ Information received from John Wankum; Manager, Cargill Molasses Terminal; Omaha, Nebraska, personal interview, 19 March 1970.

The approximations given either by the facility operators or derived from company records by the writer as to the mode of transportation used to ship molasses to the distributors are found in Table XVI.

TABLE XVI
MODE OF TRANSPORTATION FOR MOLASSES
FROM BARGE FACILITIES, IN PERCENTS

NAME	LOCATION	TRAIN	TRUCK
Steinhart Bulk Plant	Nebraska City	10	90
National Molasses	Omaha	10	90
Cargill Molasses	Omaha	0	100
Big Soo Terminal	Sioux City	20	80
Kay Dee Feed Company	Sioux City	0	100

When these approximations are coupled with the tonnage figures for molasses that each facility shipped, it was found that 9,000 tons (9.6 percent) was shipped by rail and 92,200 tons (90.4 percent) by truck.

DISTRIBUTION OF MOLASSES

The distribution area for molasses (Map III, part B, page 53,) can be divided into three major regions. These regions are based on the service areas of the five barge facilities handling molasses. The first region is that area serviced by the Steinhart facility located in Nebraska City.

The second region is the area serviced by the National and Cargill Molasses terminals located in Omaha. The service area of Big Soo and Kay Dee Feed in Sioux City comprised the third region.

The Nebraska City region has the Kansas-Nebraska state line as its southern boundary and extends into the Platte River Valley as far as the Cozad-Gothenburg area. The northern boundary is the southern boundary of the Omaha region. It is continually shifting according to which of the facilities located in these regions can supply the area at the cheapest cost to the buyer. This boundary line can be set at approximately 100 north of the Kansas-Nebraska state line. A small amount of molasses out of Nebraska City went into Iowa and Missouri. Shipment into these states was a new movement in 1969, and facility operators either could not or would not speculate as to the cause or causes. The writer, in speaking with several truck drivers, found that the Nebraska City facility was trying to enlarge its business in these states and that they were being well received by the owners of feed lots and feed distributors.

In Nebraska the Omaha region has for its southern boundary the line described previously, while its western boundary runs parallel to the Missouri River at about 120 miles, except for that area which extends up the Platte River Valley to the vicinity of Lexington. The northern boundary of the Omaha region in both Nebraska and Iowa lies about 40 miles south

of Sioux City. The Omaha region extends its influence about 80 miles into western Iowa. East of this area, most of the corn and other small grains go for cash crops or are harvested and sent out of the state for usage in animal feeds. In western Iowa a high percentage of the corn and other small grains are used for animal feed. Most of the molasses moving out of the Omaha region is used as an additive in animal feeds.¹⁷

The Sioux City molasses region covers the gretest area. It extends north of the northern boundary of the Omaha region in Iowa and Nebraska to include the remainder of those states plus southeastern South Dakota and southwestern Minnesota. A small amount was back-shipped by truck into parts of western Iowa, but this was based on an intra-company agreement between the Cargill facilities located at Omaha (Cargill Molasses Terminal) and Sioux City (Big Soo). As in the other two areas almost all of the molasses went to feed lots or feed distributors for usage as an additive to animal feeds.

CEMENT

Cement was the only commodity brought into the study area that originated within the Missouri River Basin. Cement was moved from Kansas City to Omaha by the Portland Cement Company. This cement was loaded into dry bulk barges by a

¹⁷ Ibid.

system of conveyor belts and pipes, and was unloaded from the barges by what amounted to a vacuum cleaner which forced the cement through pipes into the storage elevators.

During 1969, the Portland Cement facility at Omaha received 128,618 tons of cement by barge. During the same period this facility shipped 138,400 tons. The difference in these figures was made up by the usage of nearly 10,000 tons of cement held in storage after the 1968 shipping season. The usage of this additional cement caused a shortage of available cement during the first four months of 1970. This shortage was made up by the filling of some orders by direct rail shipments from the Portland facility in Kansas City.

The shipment of 120,408 tons (87.0 percent) of the cement was by truck, while 17,992 tons (13.0 percent) were shipped by rail. Approximately 6,500 tons (36.1 percent) of the railed and 17,400 tons (14.5 percent) of the trucked cement was sacked before it left the Omaha facility. This amounted to a total of 23,900 tons or 17.3 percent of the total shipped from this facility. This sacked cement was placed mainly in 96 pound sacks, although 48 pound sacks are being introduced at this facility. ¹⁸

¹⁸ A 96 pound sack equals one fourth of a barrel, and a 48 pound sack equals one eighth of a barrel.

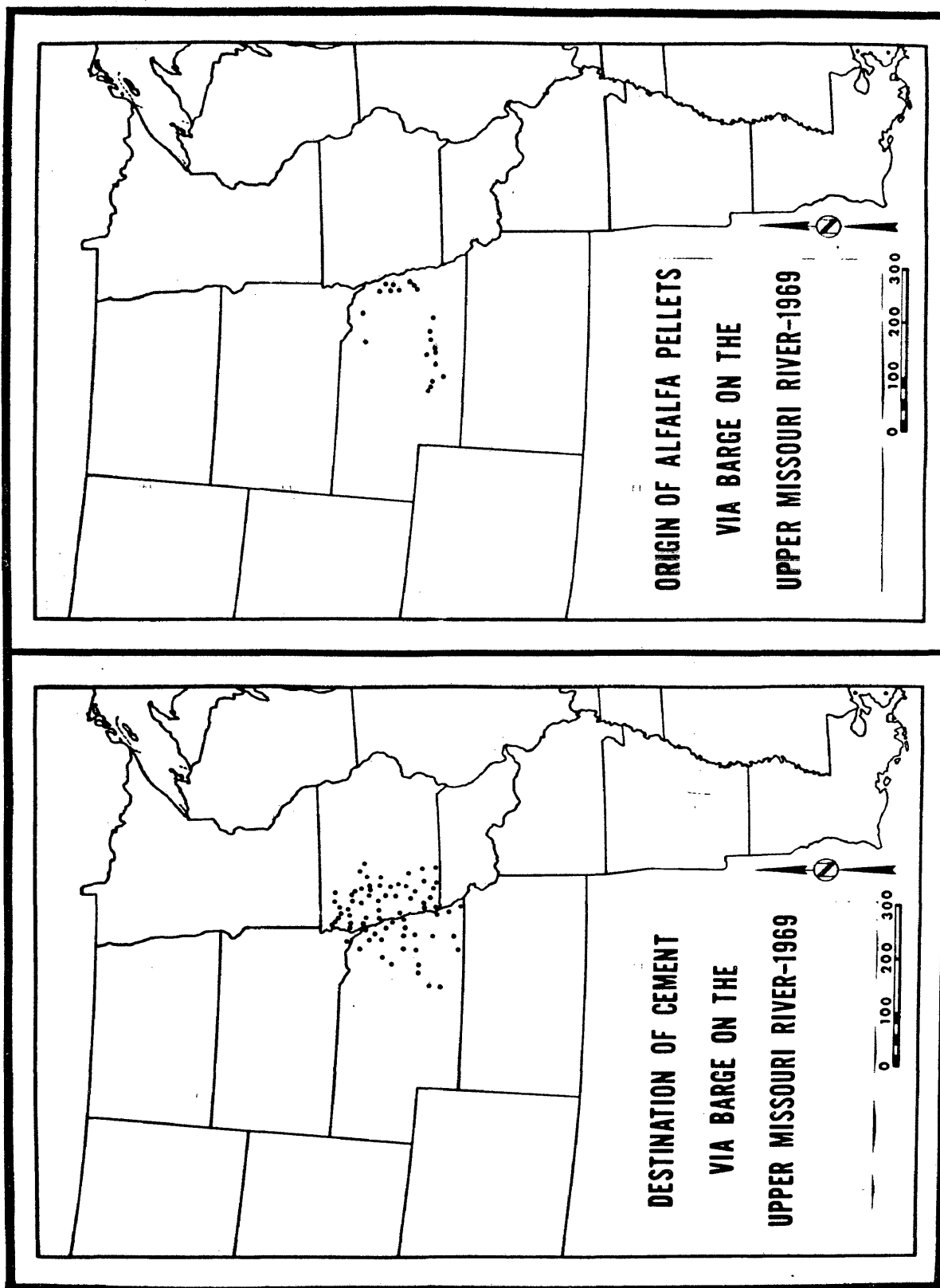
DISTRIBUTION OF CEMENT

The destination of cement from the Portland facility is shown on Map IV, part A, page 63. Nearly 87,000 tons remained in the Omaha-Council Bluffs area, with the remaining 51,000 tons being shipped to most of the larger cities in the area for construction work, or directly to contractors by on-the-job deliveries. Although on-the-job deliveries did not account for more than a third of the 51,000 tons, they do account for the majority of the points on the map. Most of the points in northeastern Nebraska and northwestern Iowa are on-the-job deliveries of small amounts of cement.¹⁹

A large amount of the 87,000 tons of cement that remained in the Omaha-Council Bluffs area was used in the construction of highways, streets, and buildings. The largest single group of users for cement were the ready-mix or pre-mix cement companies, who in turn delivered the mixed cement to the construction site. It was estimated by an official of the Portland facility that from 75-80 percent of the cement delivered in the Omaha-Council Bluffs area went to these ready-mix companies.²⁰

¹⁹ Information received from Galen Holst; Manager, Missouri Portland Cement Company; Omaha, Nebraska, personal interview, 19 March 1970.

²⁰ Ibid.

Part BMAP IVPart A

STEEL

Pittsburg supplied the major portion of steel that moved into the study area. Chicago contributed a minor portion, put at an estimated 10-15 percent. All of the steel was loaded from riparian mills directly onto dry bulk or general purpose barges. Most of the steel was already pre-worked or processed into its final form before being loaded. These items included I-beams, reinforcing steel, and pipe. Approximately 20 percent was rough steel or semi-finished, such as coil steel and steel sheets.

Upon reaching either the Omaha Municipal Dock or the Big Soo Terminal the steel was unloaded by crane. Part was placed directly onto trucks or rail cars for immediate shipment. The major portion was stored outside at these facilities until needed by one of the users. This saved the user with limited storage space the expense of track rental and car rental if he used rail as a means of delivery. The users dependent upon trucks for delivery didn't have to worry about moving the steel immediately from the barge facility to his plant, thus allowing him greater space usage at his plant.

During 1969, 44,691 tons of steel were received by the two facilities, but only around 31,000 tons had been delivered. This left nearly 14,000 tons of steel in storage at the barge facilities at the end of the shipping season. All of this was

moved by the beginning of the 1970 shipping season. This again points out the advantage of the intransit storage as afforded by the barge facilities.

Omaha Municipal Dock estimated that 60 percent of its steel was delivered by truck and 40 percent by rail, while the Big Soo Terminal estimated that 80 percent was shipped by truck and 20 percent by rail. Of the total 31,000 tons shipped from these facilities 10,600 tons (34.2 percent) went by rail and 20,400 tons (65.8 percent) by truck.

DISTRIBUTION OF STEEL

Points of delivery for steel moved out of the Omaha Municipal Dock included Omaha, Norfolk, Valley, and Columbus. Each of the points in Omaha and Norfolk received shipments by truck and rail while the users in Valley and Columbus received shipments made by truck. The steel moved out of the Big Soo Terminal was delivered to Sioux City, Sioux Falls, Le Mars, and Rock Rapid. Delivery to users within Sioux City was by rail and truck while deliveries to the other cities were made by truck.

Uses for most of the rough or semi-finished steel moved into the study area by barge included conversion into seamed and seamless pipe, small capacity storage tanks, and special made equipment and material for construction work. Most of the pre-worked or processed items were used in construction.

CHEMICALS

Chemicals brought into the study area during the 1969 shipping season consisted of undisclosed materials used in the plant processed of Allied Chemical Corporation. Although the origin or type of chemicals brought into the study area by the company were not disclosed to the writer, it was found that 15,258 tons of chemicals were shipped to the Allied facility located south of Omaha.

These chemicals were received in thermos bottle barges and unloaded by a system of pipe lines connecting the Allied facility and its barge dock. Although these chemicals were probably used or reprocessed at this facility the exact usage was not found. The chemicals were probably used in the production of an ammonia-based fertilizer called Arcadia.²¹

NEWSPRINT

The majority of newsprint which moved into the study area originated in Calhoun, Georgia. From processing plants at Calhoun the paper moves by rail either to Gunterville, Alabama or Chattanooga, Tennessee, where it is loaded onto general purpose barges. Other sources of newsprint included Houston, Texas and Pine Bluff, Arkansas. It was predicted that both Pine Bluff and Houston will soon be sending as

²¹ Information received from George E. Jacobs; Manager, Agricultural Division, Allied Chemical Corporation; Omaha, Nebraska, personal interview, 12 January 1971.

much if not more newsprint into the study area as Calhoun, due to the faster and more reliable service from the lower Mississippi and Gulf Coastal regions.²²

The Omaha Municipal Dock was the only facility to handle newsprint. It received its newsprint in 1,800 pound, 1,100 pound, or 3-400 pound rolls. These rolls were stored at this facility until needed by one of the users. Although no definite figure was given, it was estimated that 9,000 of the 14,580 tons of newsprint had been shipped to the users by the end of the shipping season. This left approximately 5,500 tons of paper in storage, which again allowed the users to have intransit storage of the raw material.

The users were located in Omaha, North Platte, and Columbus, Nebraska; plus Newton and Spirit Lake, Iowa, along with Worthington, Minnesota; and Vermillion, South Dakota. These users received an estimated 95 percent of their newsprint by truck. North Platte and Columbus were the only users who received a portion of their newsprint by rail, and in both instances these shipments made up less than 40 percent of the total tonnage that they received from the Omaha Municipal Docks.

22

Information received from John Snyder; Manager, Steinhart Terminal, Omaha Municipal Docks; Omaha, Nebraska, personal interview, 16 January 1971.

FEED SUPPLEMENT

During the 1969 shipping season feed supplement in the form of beaded dicalcium phosphate reached the study area from Florida. This feed supplement was loaded into dry bulk barges in Florida and taken via the Inter-Coastal Waterway to New Orleans for shipment into the Omaha-Council Bluffs area. Having reached its destination at the Peavey Company of Omaha, it was unloaded from the barges by crane and placed in storage, out of doors.

By the end of the shipping season an estimated 8,000 tons of the 12,000 tons received had been shipped to the users. All of the 8,000 tons were moved in bulk form with rail and truck carrying approximately 50 percent each. Points of distribution for this feed supplement were feed distributors in Omaha, Blair, and Columbus, Nebraska, plus distributors in Council Bluffs, Red Oak, and Shenandoah, Iowa.²³

BINDER TWINE

Although 475 tons of binder twine reached the study area from the Ohio Basin, the exact origin was not given. It was shipped on general purpose barges in rolls weighing 60 pounds, and unloaded at the Big Soo Terminal at Sioux City by crane.

²³ Information received from Dick Johnson, Manager, Peavey Company of Omaha; Council Bluffs, Iowa, personal interview, 21 January 1971.

From this facility it was loaded directly onto rail cars for delivery into western and central South Dakota. The exact place of delivery was not ascertained by the writer since the order slip and other paper work for this shipment could not be found.

CHAPTER FIVEOUTBOUND COMMODITIESPOINTS OF SHIPMENT

Fourteen of the twenty-two facilities handled outbound commodities during 1969. Seven of these facilities handled only outbound commodities, while the remaining seven dealt in both inbound and outbound commodities. Six of the fourteen facilities were located in the Nebraska City region, five in the Omaha region, and the remaining three in the Sioux City region. (Refer to Table XVII.)

TABLE XVII

NAME AND LOCATION OF OUTBOUND FACILITIES, AND GOODS HANDLED**

NEBRASKA CITY REGION

*Continental Grain Company	Brownville	Grain
*Consolidated Blenders	Nebraska City	Alfalfa Pellets
Steinhart Terminal Warehouse	Nebraska City	Grain
*Bartlett Grain Company	Nebraska City	Grain
Steinhart Terminal Bulk Plant	Nebraska City	Tallow
*FarMarCo	Rock Bluff	Grain

OMAHA REGION

Allied Chemical Corporation	Omaha	Chemicals
Peavey Company of Omaha	Council Bluffs	Grain
Cargill Molasses Terminal	Omaha	Tallow
*Cargill Inc.	Omaha	Grain
*FarMarCo	Omaha	Grain

SIOUX CITY REGION

*Consolidated Blenders	Blair	Alfalfa Pellets
Big Soo Terminal	Sioux City	Grain and Tallow
Kay Dee Feed Company	Sioux City	Tallow

** Refer to Map I, page 2.

* Handled only outbound commodities.

As shown in Table XVII, grain was handled by eight facilities, tallow by four facilities, alfalfa pellets by two, while only one facility shipped chemicals.¹ The commodities under these headings totaled 374,113 tons for the 1969 shipping season. The ranking of the inbound commodities is shown in Table XVIII.

TABLE XVIII

OUTBOUND COMMODITIES CARRIED ON THE UPPER MISSOURI RIVER, 1969

<u>COMMODITY</u>	<u>NET TONS</u>	<u>PERCENT OF OUTBOUND TOTAL</u>
Grain	(218,500)	(58.4)
1) Wheat	110,500	29.5
2) Soybeans	43,000	11.5
3) Milo	37,000	9.9
4) Corn	28,000	7.5
Tallow	74,868	20.0
Chemicals	49,745	13.3
Alfalfa Pellets	<u>31,000</u>	<u>8.3</u>
TOTALS	374,113	100.0

AREAS OF DESTINATION

Commodities shipped out of the study area were destined mainly for the Gulf Coastal, Missouri River, and Tennessee River areas. Unlike the origin of inbound commodities, multiple

¹ Wheat, soybeans, milo (to include all grain sorgums and related grains), and corn were included under the general heading of grain.

destinations of most of the outbound commodities made the tracing of these commodities into different regions quite difficult. This, coupled with the rule of disclosure employed by the Corps of Engineers, and the vague description by facility operators as to the destination of commodities leaving their facilities, complicated the establishment of destination areas.

The Gulf Coastal area centered on New Orleans received all of the tallow, soybeans, and corn shipped out of the study area. A high percentage of the wheat and milo also reached the Gulf Coastal area. A portion of each of these commodities was shipped direct to foreign countries.

The Missouri River area received all of the chemicals shipped from the study area. The region around the junction of the Missouri and Mississippi Rivers also received some of the wheat and milo.

The Tennessee River Valley was the destination area for all of the alfalfa pellets. This area also received substantial quantities of milo and wheat.

In addition to these areas; Buffalo, New York and Memphis, Tennessee received wheat for milling. Chicago, Illinois received wheat (a portion of which was sent to Buffalo for milling) and milo for local milling or distribution as cattle feed.

GRAIN

Wheat, soybeans, milo, and corn composed the grains shipped from the study area. Wheat and soybeans were shipped by seven of the eight facilities handling grain. Six of the eight shipped milo, while four handled corn. (Refer to Table XIX.)

TABLE XIXREGIONAL BARGE SHIPPING POINTS OF THE DIFFERENT GRAINS*NEBRASKA CITY REGION

Continental Grain Company	Brownville	Soybeans, Milo, Wheat, and Corn
Steinhart Terminal Warehouse	Nebraska City	Soybeans
Bartlett Grain Company	Nebraska City	Milo, Wheat, Soybeans, and Corn
FarMarCo	Rock Bluff	Wheat, Milo, and Soybeans

OMAHA REGION

Peavey Company of Omaha	Council Bluffs	Wheat, and Milo
Cargill Inc.	Omaha	Wheat, Milo, and Soybeans
FarMarCo	Omaha	Wheat, Milo, Soybeans, and Corn

SIOUX CITY REGION

Big Soo Terminal	Sioux City	Wheat, Corn, and Soybeans
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* Grain listed in order of the volumes shipped by the different facilities.

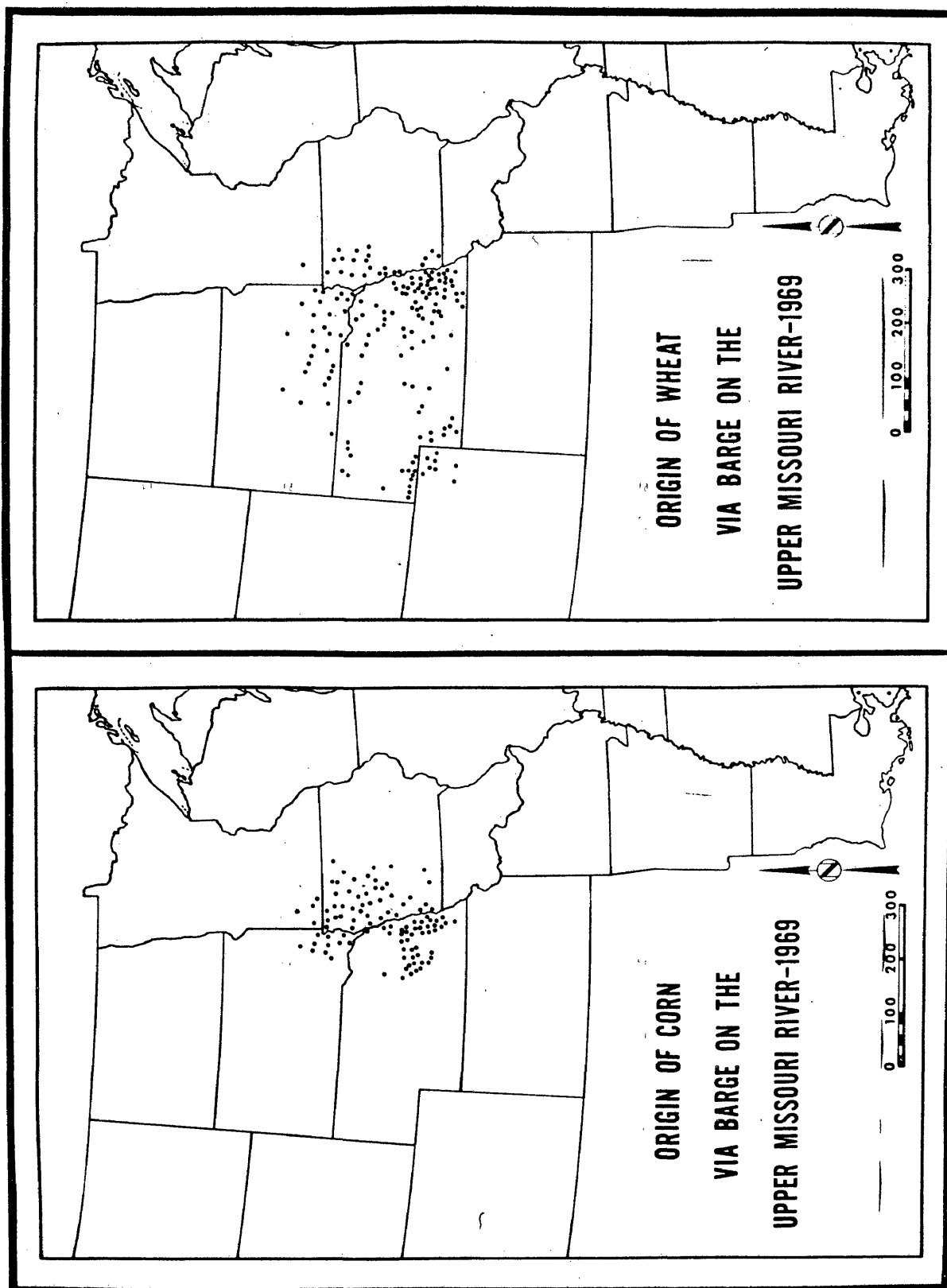
CORN

The supply region for corn can be divided into three general areas. This division is based on records and conversations with the facility operators. (Refer to Map V, part A, page 75.)

The northern supply area centering around Sioux City was the largest of the areas, and the best defined. The area consisted of southeastern South Dakota, southwestern Minnesota, northwestern Iowa, and a small section of northeastern Nebraska across the Missouri River from Sioux City.

The central area, revolving around Omaha, consisted of an area in Iowa south of the Sioux City supply area in that state, and an area in or bordering on the Platte River Valley in Nebraska. Although the supply area in Iowa can be easily defined, the area in Nebraska is vague due to the fact that corn originating in this area was shipped to local elevators first, then to elevators in the Omaha-Council Bluffs area, and finally to the barge facilities for shipment. Due to the storage time and mixing involved at each of the elevators the exact supply areas are not shown. Points on this part of the map represent in greater part local elevators which shipped corn to the elevators in the Omaha-Council Bluffs area.

The southern supply area which serves the facilities located in the Nebraska City region is for the most part well defined. It consisted of points in southwestern Iowa and southeastern Nebraska, south of the Omaha area.



Part A

MAP V

Part B

Trucks moved approximately 90-95 percent of the corn into Sioux City. As in the distribution of inbound commodities moved out of Sioux City, the existing road network around this city also facilitates the movement of commodities into the city. Corn shipped into the Big Soo facility was either stored in warehouses (with a total volume of 200,000 tons) or loaded directly into dry bulk barges. During 1969, 22,000 tons of corn was loaded from this facility compared to 6,000 tons from the other three facilities which shipped corn.²

The FarMarCo facility in Omaha received corn from grain elevators located in Omaha. Although the corn was moved to the elevators in Omaha from local elevators by rail and truck, the movement across town to the barge facility was accomplished by rail. Nearly 2,000 tons of corn was shipped from this facility.

The Continental and Bartlett Grain Companies received all of their corn by truck during 1969. The shipments were direct, as were the shipments into the Sioux City facility. Much of the corn shipped into these facilities was stored for usage in the immediate area or shipment by rail out of the study area. The Continental Grain Company having a storage capacity of 21,000 tons and Bartlett of approximately 11,000 tons. Respectively these companies shipped only 3,000 and 1,000 tons of corn by barge during 1969.

² Information received from Fred Tinker; Manager, Big Soo Terminal; Sioux City, Iowa, personal interview, 28 January 1971.

Nearly 24,000 tons of the 28,000 tons of corn was transferred to the barge facilities by truck. This represented almost 86 percent of the corn handled by these barge facilities. The remaining 4,000 tons (14 percent) was moved by rail to the barge facilities.

Corn shipped out of the study area reached the New Orleans area where the majority was transhipped to overseas ports. The majority of these foreign ports were located in Latin American countries. The corn was imported into these countries for usage in human consumption, cattle feed, and other uses.

WHEAT

The wheat origin area comprised the largest area of the outbound commodities. (Refer to Map V, part B, page 75.) This area can be divided into three regions based on the shipment of wheat to facilities in the Sioux City, Omaha, or Nebraska City regions.

Wheat shipped into the Big Soo facility came from a region comprised of southcentral and southeastern South Dakota, southwestern Minnesota, northeastern Iowa, and that area of Nebraska within 60 to 80 miles of the Nebraska-South Dakota boundary.³ As pointed out earlier this region has a good road network which facilitated the movement of commodities into the facilities at Sioux City. In the case of wheat, this

³ Ibid.

road network is augmented by the usage of the rail system through the northern section of Nebraska.

A total of 43,000 tons of wheat was shipped by barge from the Big Soo facility. although a larger amount was put into storage at this facility for either local usage or later shipment by rail. It was estimated by officials at the Big Soo, that rails accounted for 40 percent of the wheat moved into this facility, while 60 percent was moved by truck.⁴ Applying these estimates to the total shipped gives 17,000 tons by rail and 26,000 tons by truck.

Also pointed out by these officials was the fact that wheat being moved more than a distance of 150 miles was usually sent by rail. These shipments came from local elevators which served as a collecting point for wheat in their area. The majority of the shipments received within this 150 mile distance were usually made by truck as a direct shipment from the field. It should be noted that trucking from greater distances does seem to be increasing, while railed shipments within 150 miles remain stable. The reason given for this is the improvement in trucking equipment and road conditions.⁵

Wheat shipped from the Peavey, Cargill, and FarMarCo facilities totaled 41,500 tons. The supply area for these Omaha-Council Bluffs facilities consisted of a small area in western Iowa, within 40 miles of these cities, and the Platte River Valley and bordering areas in Nebraska. Also included in this supply region are points in northeastern Colorado and southwestern Nebraska.

⁴ Ibid.; ⁵ Ibid.

The eastern part of this supply area from Grand Island, Nebraska to Omaha made either direct shipments to the barge facilities by truck or shipments from the local elevators by rail. Nearly 70 percent of the wheat shipped by the barge facilities from the eastern section of this wheat area arrived at the facilities by rail. The wheat is moved by rail from the elevators in the Omaha-Council Bluffs area to the barge facilities. Since this is the mode of transportation once the wheat reaches the Omaha-Council Bluffs elevators, the barge facilities report it as railed wheat. FarMarCo reported all of its 7,000 tons as being moved by rail from elevators in Omaha. Peavey listed 60 percent (13,800 tons) as being moved by rail from elevators in Council Bluffs, and Cargill reported 70 percent (3,500 tons) moved by rail from its Omaha elevators.

The Omaha Grain Board reported that approximately 65 percent of the total wheat production moved from this eastern area into Omaha-Council Bluffs elevators was by rail and that the remaining 35 percent was by truck.⁶ A comparison of these percentages with the percentages given by the barge facilities shows that most of the wheat, moved from elevators in the Omaha-Council Bluffs area to the barge facilities, was brought into these elevators by rail.

⁶ Information received from Glenn Hewitt; Superintendent of Traffic, FarMarCo; Omaha, Nebraska, personal interview, 12 February 1971.

The western part of the supply area sent 6,500 tons of wheat into the Omaha-Council Bluffs area. 3,000 tons were received at the Cargill facility and 3,500 tons at the Peavey facility. Approximately 1,500 tons of the Cargill total and 2,000 tons of the Peavey total from this area were transported by truck. This 3,500 ton total represented 54 percent of the wheat shipped from this area, while rail carried 3,000 tons (46 percent.)

The high percentage of wheat shipped from this area by truck reflected in part the usage of the interstate connection with the Omaha-Council Bluffs area. As pointed out, most of the wheat in the Sioux City area moving more than 150 miles was by rail and wheat within 150 miles by truck. In the Omaha-Council Bluffs area the opposite holds true. The main reasons for this appears to be the location of a higher number of elevators on rail lines within 150 miles of the barge facilities, and better rail rates for the elevators within 150 miles of the Omaha-Council Bluffs area.⁷ In addition to the good interstate connections for points in the western region, the poorer rail rate structure for this area, and the practice of back hauling wheat by the trucks delivering material and goods from the Omaha-Council Bluffs area makes this a truck oriented supply area.

⁷ Ibid.

The area of southeastern Nebraska and southwestern Iowa shipped to the facilities in the Nebraska City region. Total barged wheat shipped from this region amounted to 26,000 tons. The FarMarCo facility at Rock Bluff shipped 8,000 tons, Bartlett in Nebraska City handled 5,000 tons and the Continental Grain Company at Brownville, 13,000 tons.

Trucks moved all of Continental's 13,000 tons, while 70 percent (3,500 tons) of Bartlett's wheat arrived at that facility by truck. All of FarMarCo's wheat was transported by truck, with 3,500 tons being shipped from the FarMarCo elevators in Omaha. The remaining 4,500 tons of FarMarCo wheat came from local elevators or by direct shipment from wheat fields as did the tonnages moved into the Continental and Bartlett facilities. A total of 24,500 tons (94 percent) of the wheat moved into these facilities for shipment by barge was accomplished by truck, while the remaining 1,500 tons (6 percent) was moved by rail.

The Sioux City and Nebraska City regions received most of their wheat by truck, while the Omaha-Council Bluffs area received most of its wheat by rail, as already pointed out. 64,700 tons of wheat can be traced to final transportation by truck, and 45,800 tons were accounted for by rail transportation. These figures represented 58.6 percent and 41.4 percent respectively for trucked and railed wheat to the barge facilities in the study area.

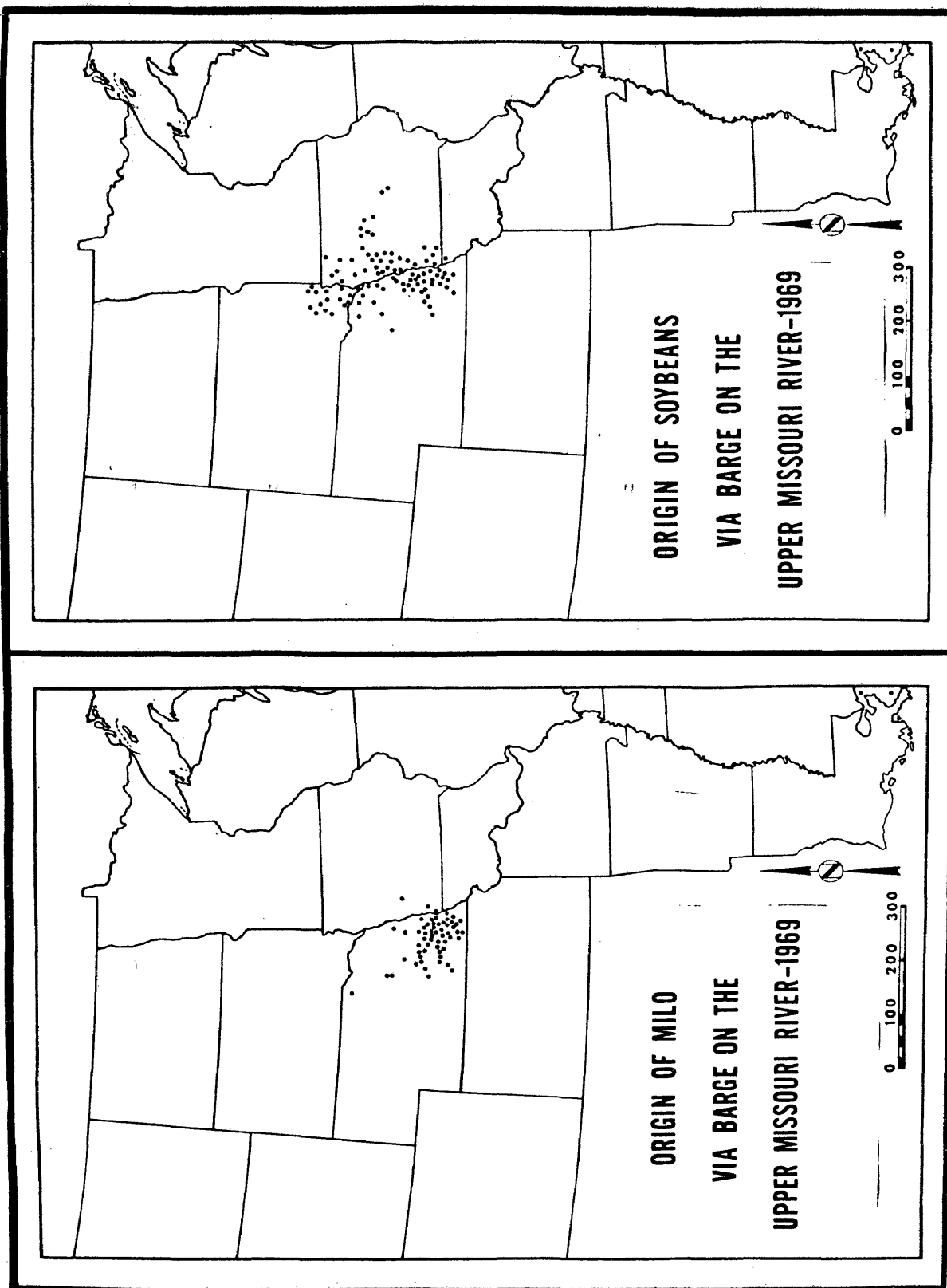
During 1969, wheat from the study area reached flour mills in Buffalo, New York; Chicago, Illinois; and Memphis, Tennessee. Along with these points wheat was transported into the Gulf Coastal and upper Tennessee River Valley for usage in cattle feeds. A substantial part of the wheat reaching the New Orleans area was shipped to foreign nations; notably, Japan, Belgium and Venezuela.

MILO

During the study period only the Nebraska City and Omaha regions shipped milo. The general supply area is shown on Map VI, part A, page 83. The general supply area can be divided into two supply areas based on shipments to the regions mentioned above.

The area supplying the Omaha region is basically the Platte River Valley and the surrounding area as it was with the corn and wheat moved into the Omaha-Council Bluffs area from Nebraska. A total of 10,000 tons of milo was traced from the supply area into the Omaha-Council Bluffs barge facilities. Peavey shipped 3,000 tons, Cargill handled 4,000 tons, and FarMarCo nearly 3,000 tons during the 1969 season.

The area in southeastern Nebraska, south of the Omaha supply area sent 27,000 tons of milo into the barge facilities located in the Nebraska City region. FarMarCo at Rock Bluff handled 7,000 tons, Bartlett nearly 6,000 tons, and Continental shipped approximately 14,000 tons.



Part B

MAP VI

Part A

The FarMarCo and Cargill facilities in Omaha received all of their milo by rail. This amounted to cross city movement of milo from elevators located within Omaha. Peavey received an estimated two-thirds (2,000 tons) of its milo by rail from elevators in Council Bluffs, while the remaining 1,000 tons arrived by truck. Therefore 90 percent (9,000 tons) was moved to these facilities by rail and 10 percent (1,000 tons) by truck.

In the Nebraska City region, FarMarCo and Continental received all of their milo by truck, while Bartlett received two-thirds (4,000 tons) by truck and the remaining 2,000 tons by rail. Therefore 25,000 tons (92.6 percent) reached the barge facilities in this region by truck and only 2,000 tons (7.4 percent) by rail.

The main reason for the differences in the modes of transportation for these two supply areas seems to be in the final method of transportation used and reported by the grain dealers and barge facilities in the Omaha-Council Bluffs area. As reported by officials of the Omaha Grain Exchange nearly 40 percent of the milo brought into this area was by truck. The difference between these figures and the ones used above, would amount to a difference of nearly 3,000 tons.⁸

⁸ Ibid.

Although this accounts for part of the differences in the modes of transportation, it should be pointed out that the FarMarCo and Continental facilities depended only on truck transportation for delivery of commodities at their facilities. In addition the facilities in the Nebraska City region are located in the major milo producing area in Nebraska, and as a result received direct shipments of truck size loads from the fields at low costs.

Using the figures given by the barge facilities, 11,000 tons (29.7 percent) of the milo was shipped by rail to their locations. The remaining 26,000 tons (70.3 percent) was handled by truck. The milo which left the study area was shipped to all three of the main distribution areas, plus Chicago. Most of the milo was used in animal feeds and in the production of sorghum-based molasses.

SOYBEANS

Soybeans were shipped to the barge facilities listed in Table XIX, page 73, from the general supply area shown on Map VI, part B, page 83. As with corn and wheat, the general supply area for soybeans can be divided into three areas based on the three regions in which the barge facilities are located.

The Sioux City area consisted of parts of northwestern and westcentral Iowa, along with eastern Nebraska, and southeastern South Dakota. This area supplied a total of 9,000 tons

of soybeans to the Big Soo Terminal for shipment by barge. The existing road network, as in the cases of the corn and wheat, helped in the movement of soybeans to this facility. 8,000 tons of soybeans arrived at the Big Soo by truck with the remaining 1,000 tons being handled by rail. The percentage for truck and rail respectively was 89 percent and 11 percent.⁹

Soybeans from the region of central and westcentral Iowa and from the region of eastern Nebraska between Lincoln and Omaha were moved into Omaha by truck and rail. 40 percent (2,000 tons) was moved by truck and 60 percent (3,000 tons) by rail. From elevators in Omaha the soybeans were moved entirely by rail to the barge facilities. Therefore, soybeans arriving at the FarMarCo and Cargill facilities in Omaha were reported as being carried entirely by rail.

The Nebraska City region was supplied by soybeans coming from southwestern Iowa and southeastern Nebraska. The area in southeastern Nebraska took in that area below the soybean supply area for the Omaha region. 29,000 tons of soybeans were shipped from the facilities in the Nebraska City region. Continental shipped 17,000 tons; Steinhart shipped 5,000 tons; Bartlett handled 3,000 tons; and FarMarCo moved 4,000 tons. Only 3,000 tons of the Steinhart total were carried by rail. The remaining 26,000 tons were handled by truck.

⁹ Information received from Fred Tinker; Manager, Big Soo Terminal; Sioux City, Iowa, personal interview, 28 January 1971.

The facilities in the study area received 34,000 tons of soybeans by truck and the remaining 9,000 tons by rail. The percentages for these figures were 79.1 percent and 20.9 percent. All of the soybeans shipped from the study area were destined for the New Orleans area. From this point the majority was shipped to foreign countries for human consumption in the form of soybean oil, meal or flour, and as an animal feed.

ALFALFA PELLETS

The Consolidated Blender facilities at Blair and Nebraska City shipped a total of 31,000 tons of alfalfa pellets. Both of these facilities received alfalfa pellets from the Platte River Valley, while the facility at Blair received additional amounts from those points in northeastern Nebraska. (Refer to Map IV, part B, page 63.)

The Blair facility received 18,000 tons of alfalfa pellets by truck from the northeastern section of Nebraska. An additional 8,000 tons was received by truck from those points in the Platte River Valley of southcentral Nebraska. All of the 26,000 tons shipped from this facility were received by truck.

The Nebraska City facility shipped 5,000 tons of alfalfa pellets during 1969. These alfalfa pellets were received from the Platte River Valley by train. In addition to the volume shipped downriver, some 9,000 tons were stored at this facility

for local usage in animal feeds. The trend at this facility in recent years has been to store more pellets than it shipped. This has allowed the facility at Blair to ship more pellets, even though the Blair facility is quite a bit smaller than the facility in Nebraska City.

With the shipment of such a high percentage of this commodity from the facility in Blair, it enables the barge operators to form a tow at this facility made up of three or four barges of alfalfa pellets which can be transported directly into the Tennessee River Valley. Although other barges may be added or the barges from a tow originating at this facility may be incorporated into another tow, the grouping of all of the alfalfa pellet barges helps in reducing time and cost required for the movement of this commodity.

As mentioned, the alfalfa pellets from these two facilities were transported into the Tennessee River Valley. The majority was destined for the Gunterville, Alabama area for usage in cattle feed. Facility operators at both Blair and Nebraska City mentioned that the companies in the area of Gunterville had already contacted their facilities for the shipment of at least 50,000 tons for the 1970 season. This was based on the projected increase in demand for cattle feed in the areas of northern Mississippi, Alabama, and Georgia.¹⁰

¹⁰ Information received from Jim Jones; Manager, Consolidated Blenders; Blair, Nebraska, personal interview, 21 March 1971.

TALLOW

Tallow was handled by four facilities as pointed out in Table XVII, page 70. These facilities were the Kay Dee Feed Company and the Big Soo Terminal in Sioux City; Cargill Molasses Terminal in Omaha; and Steinhart Terminal Bulk Plant in Nebraska City. Each of these facilities received molasses by barge during the 1969 shipping season. The importance being, that the same type of storage tanks, loading procedure, and barges are used for both of these commodities. By steam cleaning the barges that brought molasses into the study area these same barges can be used for the downriver transportation of tallow. The average cost for steam cleaning one of these molasses barges is two hundred fifty dollars.¹¹

The supply areas for the four facilities tended to be the cities in which they are located. The two terminals in Sioux City shipped a total of 44,325 tons. Of this total, Kay Dee shipped 13,770 tons while Big Soo handled 20,555 tons. Both of these facilities reported that 95 percent or more of the tallow moved through their facility came from rendering plants located within a radius of 25 miles. Usage of rail transportation accounted for the movement of all of the tallow handled by these facilities.¹²

¹¹ Information received from John Wankum; Manager, Cargill Molasses Terminal; Omaha, Nebraska, personal interview, 19 March 1970.

¹² Information received from Fred Tinker; Manager, Big Soo Terminal; Sioux City, Iowa, personal interview, 28 January 1971.

The Cargill Molasses Terminal shipped a total of 2,937 tons of tallow. This tonnage was moved by rail from rendering plants within the Omaha-Council Bluffs area. National Molasses did not ship tallow during 1969, but served as a collection and storage point for tallow from several rendering plants in the Omaha area. This facility did ship tallow by rail to the Steinhart Bulk Terminal in Nebraska City.

The Steinhart Bulk Terminal shipped 27,606 tons of tallow. The supply area not only included the vicinity around Nebraska City, but also points in the Omaha-Council Bluffs area that shipped tallow to Nebraska City. As with the other facilities, all of the tallow brought into the Steinhart Bulk Terminal was by rail.

All of the tallow leaving the study area was shipped into the New Orleans area. A portion of the tallow was used in the production of soap or synthetic materials. The rest was shipped overseas, mainly to the countries of Latin America.

CHEMICALS

The Allied Chemical plant south of Omaha supplied 49,745 tons of chemicals to the outbound total. These chemicals were pumped by pipe-line, for a distance of one mile, to their barge facilities just north of the junction of the Missouri and Platte Rivers. The chemicals were placed in "thermos-bottle" barges for shipment into the Kansas City area. From there the chemicals were moved through several different

pipelines serving the Great Plains. One of these pipelines, operated by Northern Natural Gas, passes a few miles west of the Allied facility located at Omaha, and carries this plant's product into South Dakota.¹³

Most of the chemicals shipped from the Allied plant are nitrogen products, with the majority of the tonnage being made up by Arcadia, which is a nitrogen-based fertilizer. Although this back-shipping of fertilizer into the vicinity of Kansas City is expensive, officials at Allied would not offer opinions or information as to the possibility of connecting the Northern Natural pipeline to their plant by using a short pipeline to connect their plant with the existing pipeline. ¹⁴

¹³ Information received from George E. Jacobs; Manager, Agricultural Division, Allied Chemical Corporation; Omaha, Nebraska, personal interview, 12 January 1971.

¹⁴ Ibid.

CHAPTER SIX

SUMMARY AND CONCLUSION

Although river traffic on the upper Missouri River dates back to prehistoric times, its modern basis has been laid in the last twenty-five years. At the start of this period legislation was passed for the development, improvement, and control of the Missouri River. This was followed by seven years of slow progress until the disastrous flood of 1951 spurred the rapid completion of most existing plans.

Barge traffic got off to a slow start during the years 1945-1956, and had only reached 45,000 tons on the upper Missouri River by 1957. Then in 1958, 1959, and 1960 the previous year's total tonnage was more than doubled, so that in 1960 this section of the river carried over 468,000 tons. Encouraged by these years more facilities were built along the upper Missouri, and more emphasis placed on barge and tow design for a river with the characteristics of the Missouri. As a result, the years 1962 through 1965 averaged nearly 750,000 tons each year. With the construction of more facilities and more emphasis on river traffic by existing facilities, the years 1966 through 1969 showed an average tonnage in excess of one million tons.

From this study it was found that the region surrounding the facilities along the upper Missouri River, between Sioux City, Iowa and Rulo, Nebraska, can be divided into three major regions. This division is based on the origin or destination of goods from the various facilities. Of these regions, only one exhibited a balance between inbound and outbound commodities, while the other two regions exhibited either a strong imbalance in favor of either outbound or inbound commodities.

The lower of these regions, the Nebraska City region, received only 61,583 tons of agricultural material while shipping 109,269 tons of agricultural products. Therefore, this region had a strong imbalance in favor of outbound commodities. The 170,852 tons handled by the facilities in this region represented 16.6 percent of the total volume for the study area.

The middle region centering upon Omaha-Council Bluffs showed a marked imbalance in favor of inbound commodities. Commodities destined for construction and agriculture made up most of the 475,998 tons of inbound commodities for this region, while 89,409 tons of agricultural products and chemicals were shipped from the Omaha region. The 565,407 tons handled in this region represented 51.1 percent of the commodities for the study area.

The upper-most of the regions was the Sioux City region which had a strong balance between predominantly inbound agricultural materials (175,404 tons) and outbound agricultural products (175,435 tons). The total 350,840 tons handled by the facilities in this region amounted to 32.3 percent of the commodities for the entire study area.

Although some of the commodities of these regions were restricted or controlled by company policies, the majority reflect to a high degree transportation costs and rates, coupled with market prices or purchasing costs. Competition from a growing barge transport industry has helped in holding railroad freight prices to a lower level. At the same time the expanding barge services have opened or expanded many new line of business for the railroads and truck firms in the study area.

Some 506,458 tons of the total 710,875 tons of inbound commodities were distributed by truck, with the remaining 204,417 tons being carried by rail. Of the outbound commodities transported to the barge facilities 173,700 tons were carried by truck and 140,668 tons by rail. Of the total 1,025,243 tons distributed or collected during 1969, 680,158 tons (66.3 percent) were carried by truck and the remaining 345,085 tons (33.7 percent) by rail.

The low costs and services afforded by barging, such as storage while in transit and sacking of certain commodities is appealing to many of the distributors in the study area. As channelization becomes more permanent and the general river conditions and barging methods improve, the dependability of barged commodities into the upper Missouri River area will improve. These factors, and the growing demand by the consumers for more and different commodities should assure the barge facilities on the upper Missouri River of a growing market for the commodities that they handle.

APPENDIX IBARGE FACILITY QUESTIONNAIRECONFIDENTIALCONFIDENTIAL

Name of your facility: _____

Address of this facility: _____

Date of establishment: _____

Products handled and their volume for 1969:

A) _____, Volume) _____

B) _____, Volume) _____

C) _____, Volume) _____

D) _____, Volume) _____

Storage capacity at this facility: _____

Area served by your facility: (A list of towns to which each product was sent during 1969.)

Origin of inbound, and destination of outbound commodities.

A) _____

B) _____

C) _____

D) _____

Percentage of each product transported to or from facility by:

Truck--A) _____

Railroad--A) _____

B) _____

B) _____

C) _____

C) _____

D) _____

D) _____

Does this facility own its barging equipment and tows, and if not who does your towing? _____

Does this facility have other shipping and receiving points on the Missouri River or the upper Mississippi River? If so please list their location.

Facility location factors: (list the three most important factors in the location of your facility.)

- 1) _____
- 2) _____
- 3) _____

Through time, has your waterfront site become:

More important. _____ Less important. _____ No change. _____

A) If more important, why? _____

B) If less important, why? _____

Is barge transport for your facility becoming:

More difficult. _____ Less difficult. _____ No change. _____

Would increased difficulty in usage of barge transportation cause your facility to relocate:

Yes. _____ No. _____ Don't know. _____

What was the average full-time employment at this facility (all shifts) for 1969: _____

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