CONSUMPTION OF SUPERPHOSPHATE

IN

CHICAGO AND NORTH WESTERN

TERRITORY

Chicago and North Western Railway Company
Chicago, Illinois

CHICAGO AND NORTH WESTERN RAILWAY COMPANY
400 WEST MADISON STREET, CHICAGO 6

E. A. OLSON
VICE PRESIDENT—TRAFFIC

Farm crops in the states served by the Chicago and North Western Railway consume nearly one million tons of Superphosphate per year!

In producing optimum crop yields, farms in these states could utilize up to half again as much phosphate material each year. States served by the C&NW are one of the largest markets for phosphate materials in the United States. This market is expanding constantly as farmers strive for higher and higher yields per acre.

The use of phosphate fertilizers has grown phenomenally in the past two decades. Better fertilizer products, new and better methods of application, more technical knowledge, have combined to make planned fertilizer programs a sound investment for today's farmer.

The expanding market for phosphate materials has caused increasingly heavy demands on the existing rock deposits. As a result, known—but undeveloped—deposits are being re-evaluated for potential use. Such is the case with phosphate deposits in west central Wyoming, tributary to the Chicago and North Western Railway. Some of these undeveloped reserves will be put into production sooner than was anticipated a few years ago.

This study was prepared for the phosphate industry. It summarizes the markets and concentrations of phosphate fertilizer use in Chicago and North Western Railway's rich agricultural territory.

Dependable, low-cost transportation is a vital factor in the development of America's remaining phosphate deposits. Our own Agricultural and Resource Development Department at Chicago invites your inquiries.

Sincerely,

E. A. Olson

CONTENTS

INTRODUCTION

Phosphorus is an essential element needed for plant growth. Many soils are low in available phosphorus because the nutrient has been removed by cropping and erosin.

Phosphorus cannot be replenished by application of barnyard manures or other wastes. Reserves of this element removed from the soil through cropping must be replaced by commercial fertilizer application to maintain and improve soil productivity.

Phosphorus in commercial fertilizers is measured in terms of available phosphoric acid (P_2O_5). Approximately 80 per cent of total phosphoric acid applied to soils is contained in mixed fertilizers which also contain nitrogen or potash or both. Twenty per cent is applied in superphosphate fertilizers which contain only phosphoric acid as a plant nutrient.

Phosphoric acid content of superphosphate ranges from approximately 18 per cent to 48 per cent. Lower analysis fertilizers are classified as normal superphosphates. Those with more than 40 per cent phosphoric acid are called concentrated, double or triple superphosphate. Commonly used superphosphate grades are 0-20-0, 0-45-0, and 0-46-0.

Superphosphate is made by treating rock phosphate with either sulfuric acid, phosphoric acid or a combination of the two. Major rock phosphate deposits in the United States are located in Florida, Idaho, Montana, Tennessee, Utah, and Wyoming. Florida mined rock phosphate is used in the largest volume.

Rock phosphate is sometimes used as a fertilizer source of phosphoric acid. Usage is limited because only a small part of total phosphoric acid content is available to plants the year of application.

The states served by the Chicago and North Western Railway -- Illinois, Iowa, Minnesota, Nebraska, South Dakota, Wisconsin and Wyoming -- consumed more than 940,000 tons of superphosphate during the year ending June 30, 1958. This volume was comprised of superphosphate applied alone and in manufacture of fertilizer mixtures. The total phosphoric acid was an estimated 315,900 tons.

An additional 84,000 tons of phosphoric acid was supplied from such other sources as: Rock phosphate, "Thomas" or basic slag and bones. Consumption of phosphoric acid from all sources totaled approximately 400,000 tons. It has been estimated that these states could utilize 585,000 tons of phosphoric acid annually in producing optimum crop yields. Between 1950 and 1958 annual phosphoric acid consumption in these states increased by 60,000 tons, or an average of about 7,500 tons yearly.

SUPERPHOSPHATE CONSUMPTION
CHICAGO AND NORTH WESTERN STATES
YEAR ENDING JUNE 30, 1958

State	As Superphosphate (tons)	In Mixtures (tons)	Total (tons)
Illinois	78,850	227,100	305,950
Iowa	69,500	161,000	230,500
Minnesota	30,650	131,600	162,250
Nebraska	18,200	15,800	34,000
* South Dakota	4,150	8,600	12,750
Wisconsin	2,900	191,900	194,800
** Wyoming	2,700	750	3,450
Total	206,950	736,750	943,700

* - First half of 1958
** - Consumption in 1957

Each state has enacted legislation which protects both the consumer and fertilizer manufacturer. The consumer is assured that fertilizer he purchases has met certain standards and has contents as labeled. The manufacturer is protected because all fertilizer sold must be inspected by a State agency which eliminates inferior products being offered for sale at below market prices.

Inspection agencies in Chicago and North Western states are:

Illinois
Illinois Department of Agriculture
Division of Foods, Dairies and Standards
6th and Sangamon Streets
Springfield

Iowa
Iowa Department of Agriculture
Chemical Laboratory
Laboratory Building
East 7th and Court Streets
Des Moines

Minnesota
Minnesota Department of Agriculture
Feed and Fertilizer Division
548 State Office Building
St. Paul

Nebraska
Nebraska Department of Agriculture
Bureau of Dairies and Foods
P.O. Box 95
State House Station
Lincoln

South Dakota	South Dakota Department of Agriculture Division of Plant Industry State Office Building Pierre
Wisconsin	Wisconsin Department of Agriculture 206 Biochemistry Building Madison
Wyoming	Wyoming Department of Agriculture 308 Capitol Building Cheyenne

ILLINOIS

Nearly 79,000 tons of superphosphate fertilizers were used on Illinois farms during the year ending June 30, 1958. Phosphoric acid content totaled approximately 28,300 tons, or an average of 35.8 per cent. The three leading superphosphates used were 0-20-0, 0-45-0 and 0-46-0.

It is estimated an additional 227,000 tons of superphosphate were used in manufacture of mixed fertilizers containing phosphoric acid and other nutrients. Phosphoric acid content of these mixtures totaled approximately 81,100 tons, or 15.7 per cent.

ILLINOIS
CONSUMPTION OF FERTILIZERS CONTAINING SUPERPHOSPHATE
YEAR ENDING JUNE 30, 1958

Kind of Fertilizer	Estimated Consumption (tons)	Estimated Superphosphate Content (tons)	Estimated Phosphoric Acid Content (tons)
Superphosphates:			
0-18-0	7,350	7,350	1,323
0-20-0	20,470	20,470	4,094
0-27-0	2,510	2,510	678
0-45-0	15,769	15,769	7,096
0-46-0	31,471	31,471	14,477
0-47-0	305	305	143
0-48-0	982	982	471
Superphosphate totals	78,857	78,857	28,282
Mixtures:			
Nitrogen-Phosphate	12,600	12,100	4,300
Nitrogen-Phosphate-Potash	472,000	197,400	70,500
Phosphate-Potash	31,600	17,600	6,300
Mixtures totals	516,200	227,100	81,100
Superphosphates and Mixtures totals	595,057	305,957	109,382

The map, page 6, shows the consumption of commercial fertilizer by county in the area served by the Chicago and North Western. These figures were obtained from an Illinois Annual Farm Census and totals

were enumerated by the assessors. According to these figures, the area shown on the map used 45 per cent of the commercial fertilizer applied to crop land in Illinois in 1954.

Consumption figures in different grades of fertilizer are not known to be available.

Corn is the principal crop to which commercial fertilizers are applied. Data taken in 1954 indicated that over 60 per cent of the total corn acreage was fertilized and that an average of 20 pounds of phosphoric acid were used on each fertilized acre. Other major crops which receive fertilizers containing phosphate include wheat, oats and soybeans.

Illinois farmers used nearly 531,000 tons of rock phosphate as a supplier of phosphoric acid during the year ending June 30, 1958. Iowa and Minnesota used only 6,700 and 5,500 tons, respectively. There are two main factors largely responsible for the large usage in Illinois; factors which do not apply in other North Western states.

The first factor is the Agricultural Stabilization and Conservation (ASC) payments made for rock phosphate application which do not apply to superphosphate or mixed fertilizers. The second factor is the influence of fertilizer recommendations made a number of years ago by the University of Illinois. These recommendations showed extra benefits to be received from rock phosphate as compared to superphosphate. Presently, the University recommends superphosphate to a greater extent; however, they still recommend the use of rock phosphate for the purpose of building adequate soil reserves of phosphate materials.

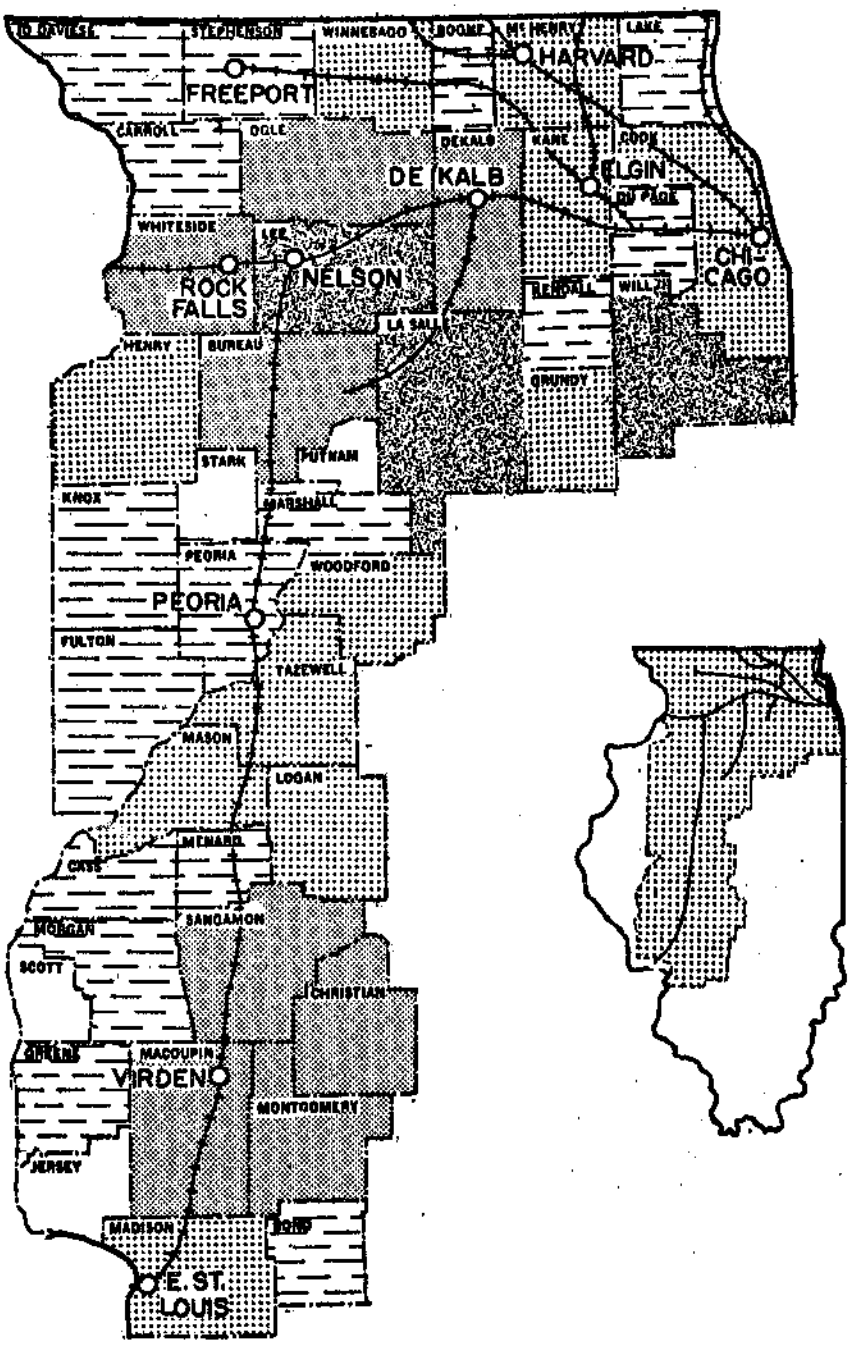
It seems reasonable to expect that the ASC payments will be removed in the future because only Illinois and Missouri now have this provision. When this occurs, superphosphate will become a cheaper source of phosphoric acid.

ILLINOIS COMMERCIAL FERTILIZER CONSUMPTION 1954

CHICAGO AND NORTH WESTERN TERRITORY

Number of Tons Used Per County

- Under 5,000
- 5,000 - 9,999
- 10,000 - 14,000
- 15,000 19,999
- Over 20,000
- C&NW Railway



IOWA

Approximately 64,200 tons of superphosphate fertilizers were applied to Iowa farmland during the year ending June 30, 1958. Phosphoric acid content averaged 34.5 per cent, or a total of 20,700 tons. The three leading superphosphates used were 0-18-0, 0-20-0 and 0-46-0.

An estimated 171,500 tons of superphosphate were used in manufacture of mixed fertilizer containing phosphoric acid and other nutrients. Phosphoric acid content of these mixtures totaled approximately 55,500 tons, or an average of 17.4 per cent.

IOWA
CONSUMPTION OF FERTILIZERS CONTAINING SUPERPHOSPHATE
YEAR ENDING JUNE 30, 1958

Kind of Fertilizer	Estimated Consumption (tons)	Estimated Superphosphate Content (tons)	Estimated Phosphoric Acid Content (tons)
Superphosphates:			
0-18-0	14,598	14,598	2,628
0-19-0	14	14	3
0-20-0	17,446	17,446	3,489
0-21-0	124	124	26
0-25-0	10	10	3
0-27-0	95	95	26
0-30-0	276	276	83
0-45-0	10,538	10,538	4,742
0-46-0	21,061	21,061	9,688
0-48-0	21	21	10
Superphosphate totals	64,194	64,194	20,703
Mixtures:			
Nitrogen-Phosphate	38,500	26,265	8,500
Nitrogen-Phosphate-Potash	258,200	134,700	43,600
Phosphate-Potash	16,700	10,500	3,400
Mixtures totals	313,400	171,465	55,500
Superphosphates and Mixtures totals	382,895	235,659	79,404

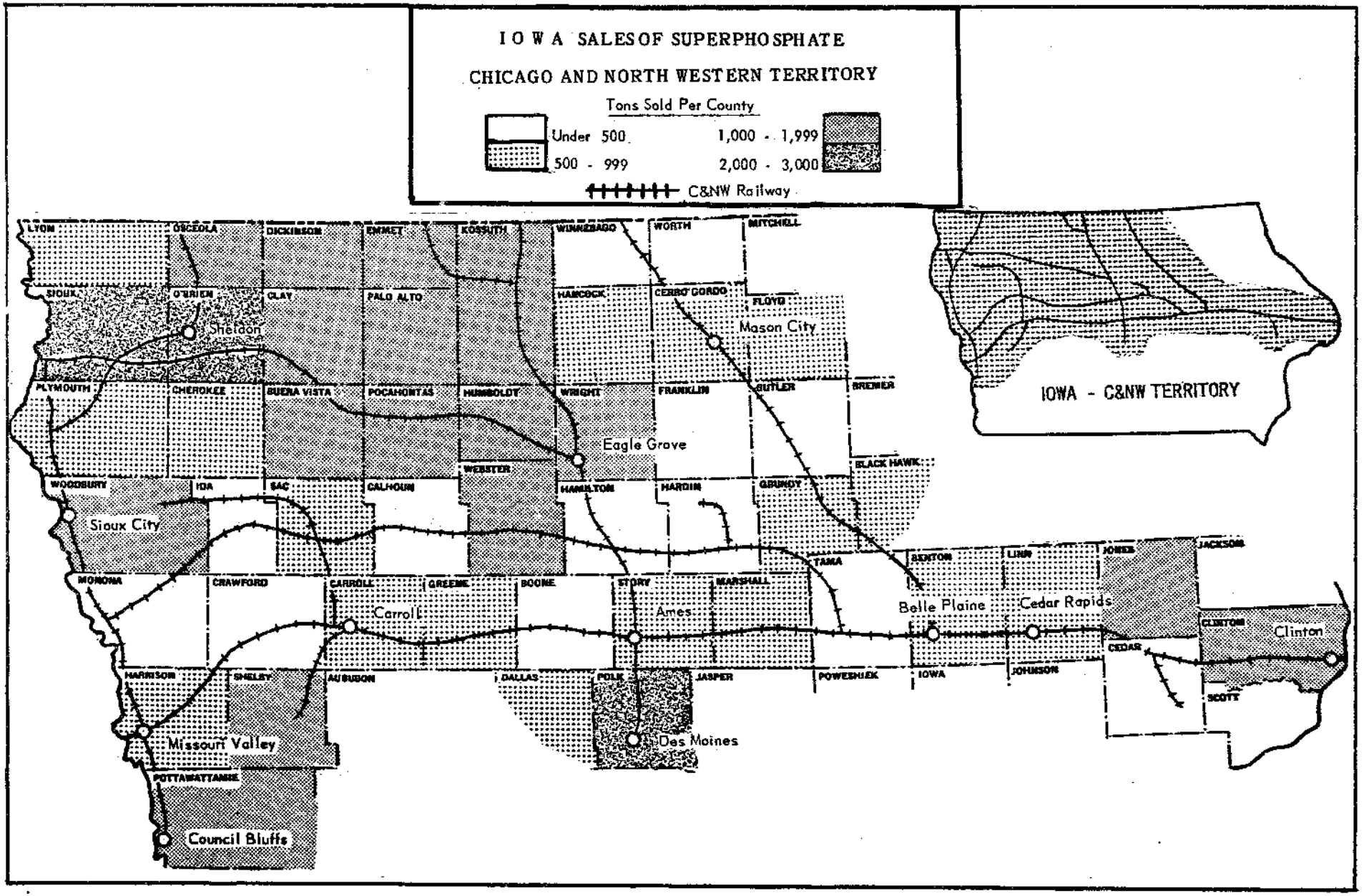
The map, page 9, indicates the sales of superphosphate by counties in 1957 and 1958. It should be understood that sales may have been recorded in one county for use in another nearby county.

The area outlined on the map recorded approximately 70 per cent of the total superphosphate sold in the State of Iowa.

The southern area of the state contains soils which are subject to erosion and best adapted to pasture and hay production. The northeast area has similar soil characteristics and dairying is an important enterprise here. Both of these general areas consume relatively smaller volumes of superphosphate.

A survey made in 1953 indicated that an average of 27 pounds of phosphoric acid were used per fertilized acre of all crops. For corn the average was 21 pounds and for small grains, principally oats, the average was 39 pounds.

Over 35 different fertilizer manufacturers were licensed to sell superphosphate in Iowa during 1958. Locations of these manufacturers included the States of Alabama, Arkansas, Florida, Idaho, Illinois, Iowa, Minnesota, Missouri, Nebraska, Utah and Washington.


IOWA SALES OF SUPERPHOSPHATE
CHICAGO AND NORTH WESTERN TERRITORY
Tons Sold Per County
Under 500
500 - 999
1,000 - 1,999
2,000 - 3,000
C&NW Railway
IOWA - C&NW TERRITORY
LYON
OSCEOLA
DICKINSON
EMMET
KOSSUTH
WINNEBAGO
WORTH
MITCHELL
SIOUX
O'BRIEN
CLAY
PALO ALTO
HANCOCK
CERRO GORDO
FLOYD
Sheldon
Mason City
PLYMOUTH
CHEROKEE
BUENA VISTA
POCAHONTAS
HUMBOLDT
WRIGHT
FRANKLIN
BUTLER
BREMER
Eagle Grove
WEBSTER
BLACK HAWK
WOODBURY
IDA
SAC
CALHOUN
HAMILTON
HARDIN
GRUNDY
Sioux City
TAMA
BENTON
LINN
JONES
JACKSON
MONONA
CRAWFORD
CARROLL
GREENE
BOONE
STORY
MARSHALL
Carroll
Ames
Belle Plaine
Cedar Rapids
CLINTON
Clinton
CEDAR
HARRISON
SHELBY
AUDUBON
DALLAS
POLK
JASPER
POWESHIEK
IOWA
JOHNSON
SCOTT
Des Moines
Missouri Valley
POTTAWATTAMIE
Council Bluffs

MINNESOTA

Over 30,600 tons of superphosphate fertilizers were applied to Minnesota farmland during the year ending June 30, 1958. Average phosphoric acid content of these fertilizers was approximately 41.5 per cent and totaled 12,800 tons.

It is estimated an additional 131,700 tons of superphosphate were used in manufacture of mixed fertilizers containing phosphoric acid and other nutrients. These mixtures contained an estimated 20.7 per cent phosphoric acid, or a total of 54,650 tons.

MINNESOTA
CONSUMPTION OF FERTILIZERS CONTAINING SUPERPHOSPHATE
YEAR ENDING JUNE 30, 1958

Kind of Fertilizer	Estimated Consumption (tons)	Estimated Superphosphate Content (tons)	Estimated Phosphoric Acid Content (tons)
Superphosphates:			
0-20-0	4,950	4,950	990
0-42 to 50-0	25,691	25,691	11,818
Superphosphate totals	30,641	30,641	12,808
Mixtures:			
Phosphate-Potash	32,900	17,950	7,450
Nitrogen-Phosphate-Potash	230,900	113,750	47,200
Mixtures totals	263,800	131,700	54,650
Superphosphates and Mixtures totals	294,441	162,341	67,458

Superphosphate consumption in Minnesota is concentrated in the southern third of the State and in the Red River Valley area in the western part. More than 50 per cent of the soils here are low in phosphorus content. Other Minnesota areas consume very little superphosphate and other fertilizers because they are not adapted to crop production.

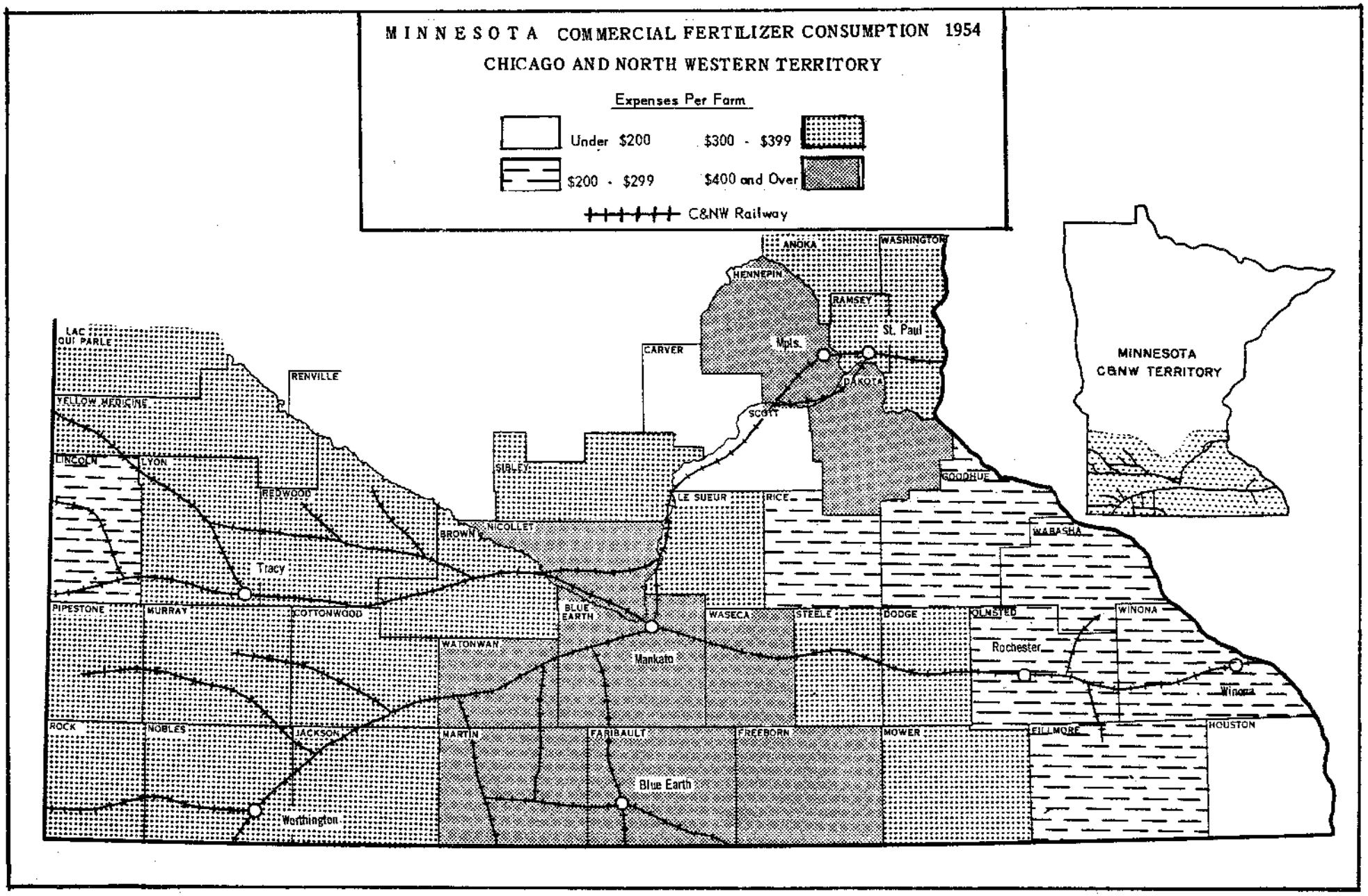
The map on page 12 shows the expenses incurred on purchase of commercial fertilizers by Minnesota farmers living in the area served by the Chicago and North Western. They spent an average of $324.00

each in the Year 1954 for commercial fertilizer.

Farmers living in the eight counties bordering the Red River and Big Stone Lake averaged $454.00, while farmers in the remainder of the State averaged only about $190.00 each.

Corn and small grains are the principal crops fertilized with superphosphate. Potatoes, sugar beets and sweet corn also receive important quantities. Soybeans are generally not fertilized the year of planting because of beneficial effects from carryover fertilizer.

There are forty different fertilizer manufacturers licensed to sell superphosphate in Minnesota during 1958. Locations of these manufacturers include the States of Arkansas, Florida, Idaho, Illinois, Iowa, Maryland, Minnesota, Montana, New Jersey, New York, North Dakota, Ohio, Oklahoma, Utah and Wisconsin.


MINNESOTA COMMERCIAL FERTILIZER CONSUMPTION 1954
CHICAGO AND NORTH WESTERN TERRITORY
Expenses Per Farm
Under $200
$200 - $299
$300 - $399
$400 and Over
C&NW Railway
MINNESOTA
C&NW TERRITORY
LAC QUI PARLE
YELLOW MEDICINE
LINCOLN
LYON
REDWOOD
RENVILLE
BROWN
NICOLLET
SIBLEY
CARVER
ANOKA
HENNEPIN
RAMSEY
WASHINGTON
Mpls.
St. Paul
DAKOTA
SCOTT
GOODHUE
LE SUEUR
RICE
WABASHA
WINONA
Tracy
PIPESTONE
MURRAY
COTTONWOOD
WATONWAN
BLUE EARTH
Mankato
WASECA
STEELE
DODGE
OLMSTED
Rochester
Winona
ROCK
NOBLES
JACKSON
MARTIN
FARIBAULT
FREEBORN
MOWER
FILLMORE
HOUSTON
Worthington
Blue Earth

NEBRASKA

Approximately 18,200 tons of superphosphate fertilizers were used in Nebraska during the year ending June 30, 1958. Phosphoric acid content of these fertilizers averaged 43.0 per cent, or a total of 7,850 tons.

There were an additional 15,800 tons of superphosphate used in manufacture of mixed fertilizers consumed during this same period. These fertilizers contained an estimated 6,800 tons of phosphoric acid, or an average of 24.3 per cent.

NEBRASKA
CONSUMPTION OF FERTILIZERS CONTAINING SUPERPHOSPHATE
YEAR ENDING JUNE 30, 1958

Kind of Fertilizer	Estimated Consumption (tons)	Estimated Superphosphate Content (tons)	Estimated Phosphoric Acid Content (tons)
Superphosphates:			
0-18 to 20-0	1,630	1,630	325
0-30 to 52-0	16,600	16,600	7,530
Superphosphate totals	18,230	18,230	7,855
Mixtures:			
Phosphate-Potash	600	256	110
Nitrogen-Phosphate	17,500	11,650	5,000
Nitrogen-Phosphate-Potash	10,000	3,960	1,700
Mixtures totals	28,100	15,866	6,810
Superphosphates and Mixtures totals	46,330	34,096	14,665

The map, page 15, shows the consumption of commercial fertilizer in the area served by the Chicago and North Western. This area used 56 per cent of the commercial fertilizer sold in Nebraska in 1957. Other primary agricultural areas are located along the Platte River, where irrigation is possible. The eastern fourth of the state is the heaviest consuming area because rainfall is sufficient to produce corn, grain sorghums, soybeans and legumes.

Southern and western areas receive less rainfall. Crop production is limited mainly to wheat, the principal crop fertilized with superphosphate in these areas.

The large section in north-central Nebraska where a very small volume of superphosphate is used is known as the sandhills country. Practically the entire area can be used only for grazing purposes.

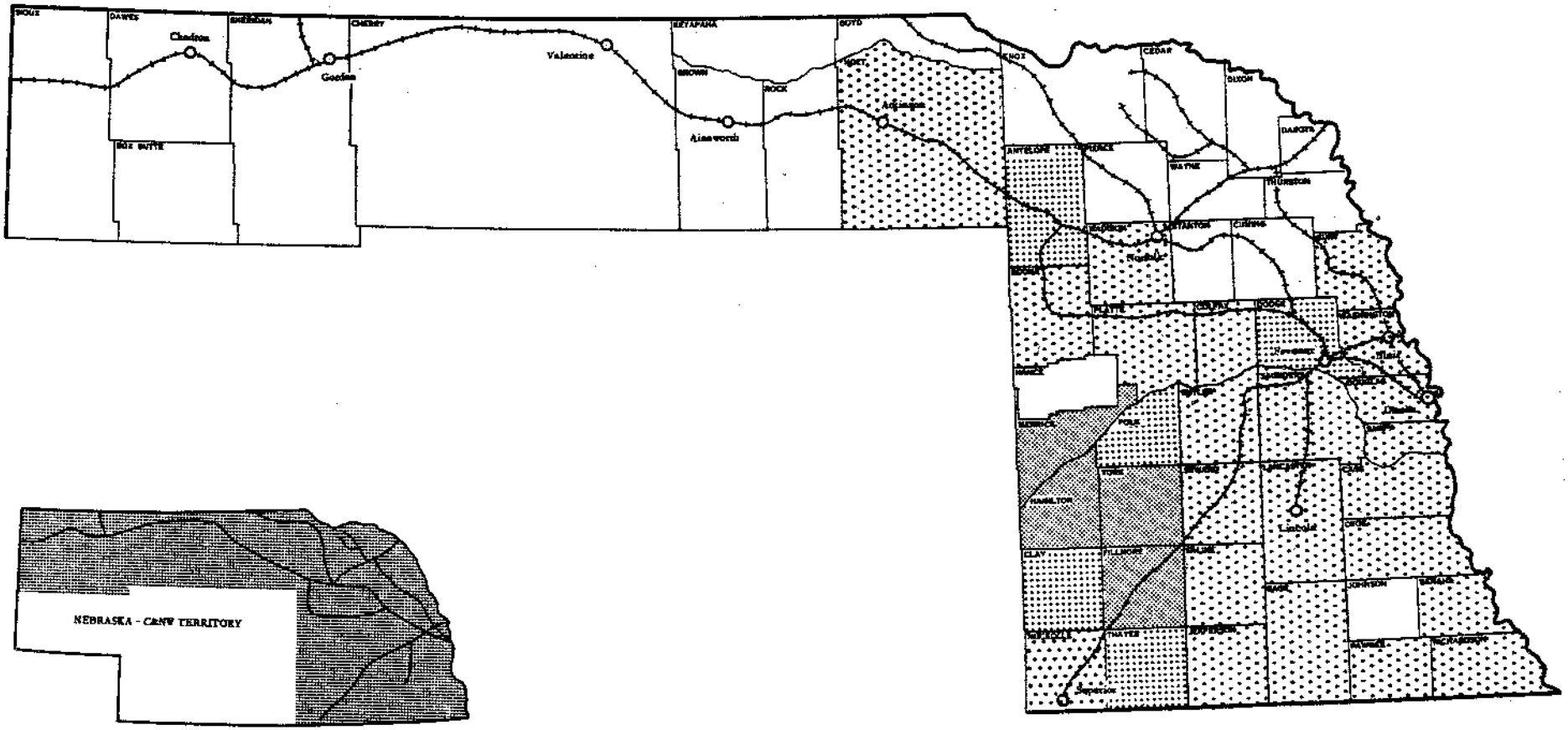
Fourteen fertilizer manufacturers sold superphosphate in Nebraska during 1958 according to inspection reports of the Nebraska Department of Agriculture. These manufacturers were located in eight states including Arkansas, Florida, Idaho, Missouri, Montana, Nebraska, Oklahoma and Utah.

NEBRASKA COMMERCIAL FERTILIZER CONSUMPTION 1957

CHICAGO AND NORTH WESTERN TERRITORY

Number of Tons Used Per County

- Under 1,000
- 1,000 - 2,999
- 3,000 - 4,999
- 5,000 - 8,000
- C&NW Railway



SOUTH DAKOTA

Approximately 4,150 tons of superphosphate were used in South Dakota during the first half of 1958; about three fourths of total consumption during the year. These fertilizers contained 45 per cent phosphoric acid or nearly 1,900 tons.

As estimated 8,600 tons of superphosphate were used in manufacture of mixed fertilizers applied during the same period. The mixtures contained approximately 24.5 per cent phosphoric acid, or 3,900 tons.

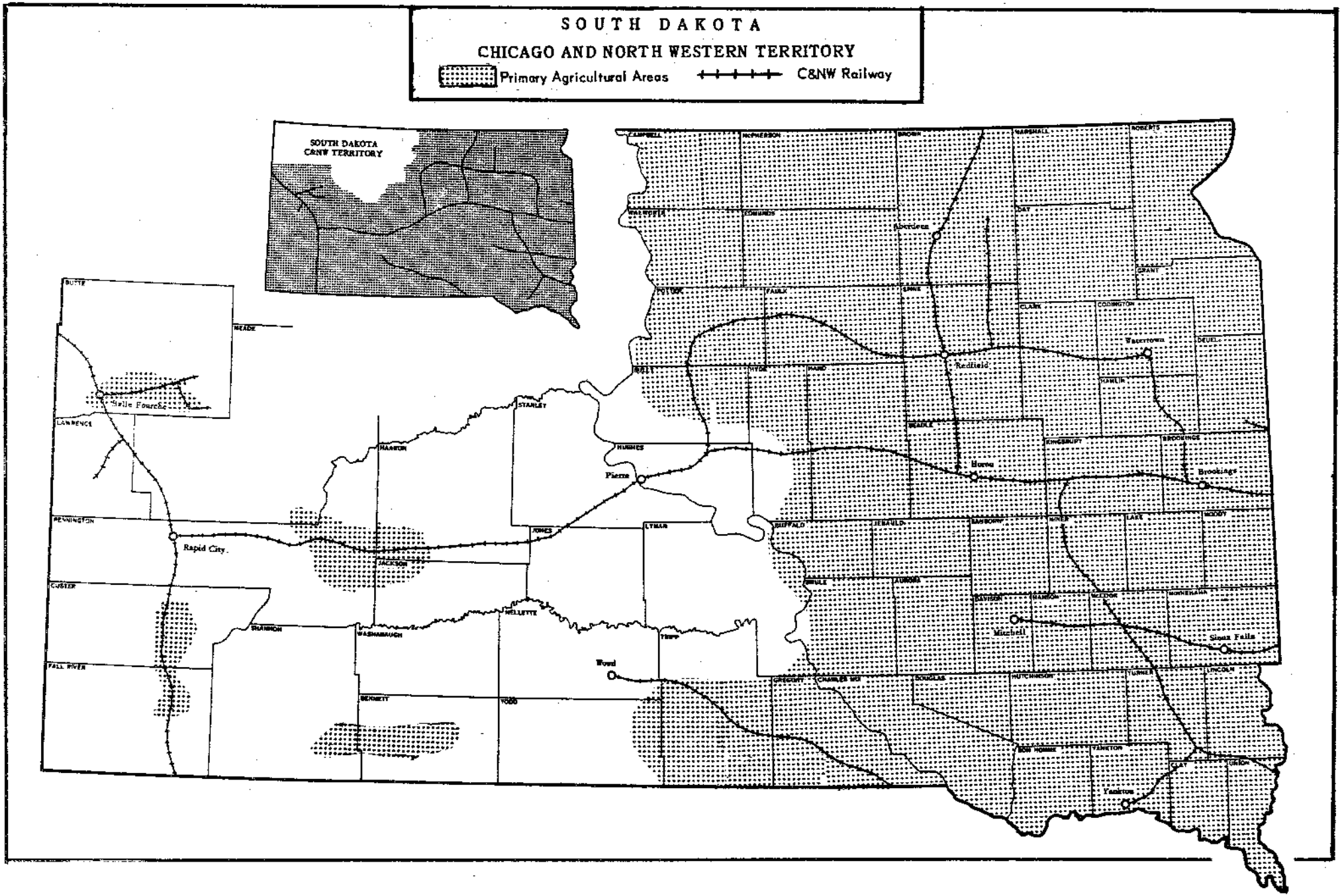
SOUTH DAKOTA
CONSUMPTION OF FERTILIZERS CONTAINING SUPERPHOSPHATE
FIRST HALF of 1958

Kind of Fertilizer	Estimated Consumption (tons)	Estimated Superphosphate Content (tons)	Estimated Phosphoric Acid Content (tons)
Superphosphates:			
0-20-0	163	163	33
0-45,46,48-0	3,982	3,982	1,832
Superphosphate totals	4,145	4,145	1,865
Mixtures:			
Nitrogen-Phosphate	14,700	8,200	3,700
Nitrogen-Phosphate-Potash	1,000	375	170
Phosphate-Potash	50	35	15
Mixtures totals	15,750	8,610	3,885
Superphosphates and Mixtures totals	19,895	12,755	5,750

The major areas of superphosphate usage in South Dakota are outlined in the map, page 18. The eastern half of the State generally receives sufficient rainfall to produce corn, oats, soybeans and legumes, all of which are fertilized with superphosphate. Soils in this area were formed by glacial deposits. Topography and fertility qualities make them suited to crop production.

Western South Dakota soils are unglaciated and are mainly very rolling in topography. Many consist of clay or sand. These soil qualities coupled with very limited rainfall limit agricultural production.

The superphosphate consuming areas are either irrigated or can be utilized in wheat production. Sugar beets are a principal crop fertilized in irrigated areas.


SOUTH DAKOTA
CHICAGO AND NORTH WESTERN TERRITORY
Primary Agricultural Areas
C&NW Railway
SOUTH DAKOTA C&NW TERRITORY
Aberdeen
Watertown
Redfield
Pierre
Huron
Brookings
Rapid City
Mitchell
Sioux Falls
Yankton
Wood
Belle Fourche
MEADE
LAWRENCE
PENNINGTON
CUSTER
FALL RIVER
HARDING
BUTTE
CAMPBELL
McPHERSON
MARSHALL
ROBERTS
WALWORTH
EDMUNDS
DAY
GRANT
POTTER
FAULK
SPINK
CLARK
CODINGTON
DEUEL
HYDE
HAND
HAMLIN
BEADLE
KINGSBURY
BROOKINGS
STANLEY
HUGHES
JONES
LYMAN
BUFFALO
JERAULD
SANBORN
MINER
LAKE
MOODY
JACKSON
WHITE
AURORA
DAVISON
HANSON
MCCOOK
MINNEHAHA
SHANNON
WASHABAUGH
WELLETTE
TRIPP
BENNETT
TODD
GREGORY
CHARLES MIX
DOUGLAS
HUTCHINSON
TURNER
LINCOLN
BON HOMME
HUTTON
CLAY
UNION

WISCONSIN

Approximately 2,870 tons of superphosphate fertilizers were used in Wisconsin during the year ending June 30, 1958. Average phosphoric acid content was 31.6 per cent, or a total of over 900 tons.

It is estimated an additional 191,000 tons of superphosphate were used in formulation of mixed fertilizers containing phosphate and other nutrients. The mixtures contained an average 16.1 per cent phosphoric acid or about 60,700 tons.

WISCONSIN
CONSUMPTION OF FERTILIZERS CONTAINING SUPERPHOSPHATE
YEAR ENDING JUNE 30, 1958

Kind of Fertilizer	Estimated Consumption (tons)	Estimated Superphosphate Content (tons)	Estimated Phosphoric Acid Content (tons)
Superphosphates:			
0-18-0	139	139	15
0-20-0	1,436	1,436	287
0-45 to 50-0	1,295	1,295	615
Superphosphate totals	2,870	2,870	917
Mixtures:			
Nitrogen-Phosphate-Potash	296,000	152,100	48,135
Phosphate-Potash	81,600	39,800	12,600
Mixtures totals	377,600	191,900	60,735
Superphosphates and Mixtures totals	380,470	194,770	61,647

Superphosphate usage in Wisconsin is more concentrated in the southern half of the State and in potato-producing areas Antigo, Rhinelander, Rice Lake and Eagle River. The map on page 21 shows the consumption of commercial fertilizer by counties for the Year 1948. These figures were obtained from the State farm assessors census and totals were enumerated by the assessors.

Soils in the southern half of the State can be used for production of hay, oats, corn and soybeans. Length of growing season is sufficient to mature corn for grain.

At least 60 per cent of total land area in the northern half is covered with timber. Soils on cleared land are not productive. Length of growing season limits production of soybeans and corn for grain. These combined factors greatly limit superphosphate usage in this area of the State.

It has been estimated that Wisconsin farmers could profitably employ fertilizers containing nearly 106,000 tons of phosphoric acid. Consumption during the year ending June 30, 1958, totaled approximately 64,800 tons from all fertilizers, or 60 per cent of the potential.

Nine different fertilizer manufacturers sold superphosphate fertilizers in the State during the 1957-1958 season. These manufacturers were located in five states including Illinois, Florida, Minnesota, New Jersey and Wisconsin.

WISCONSIN

COMMERCIAL FERTILIZER CONSUMPTION 1948

CHICAGO AND NORTH WESTERN TERRITORY

Number of Tons Used Per County

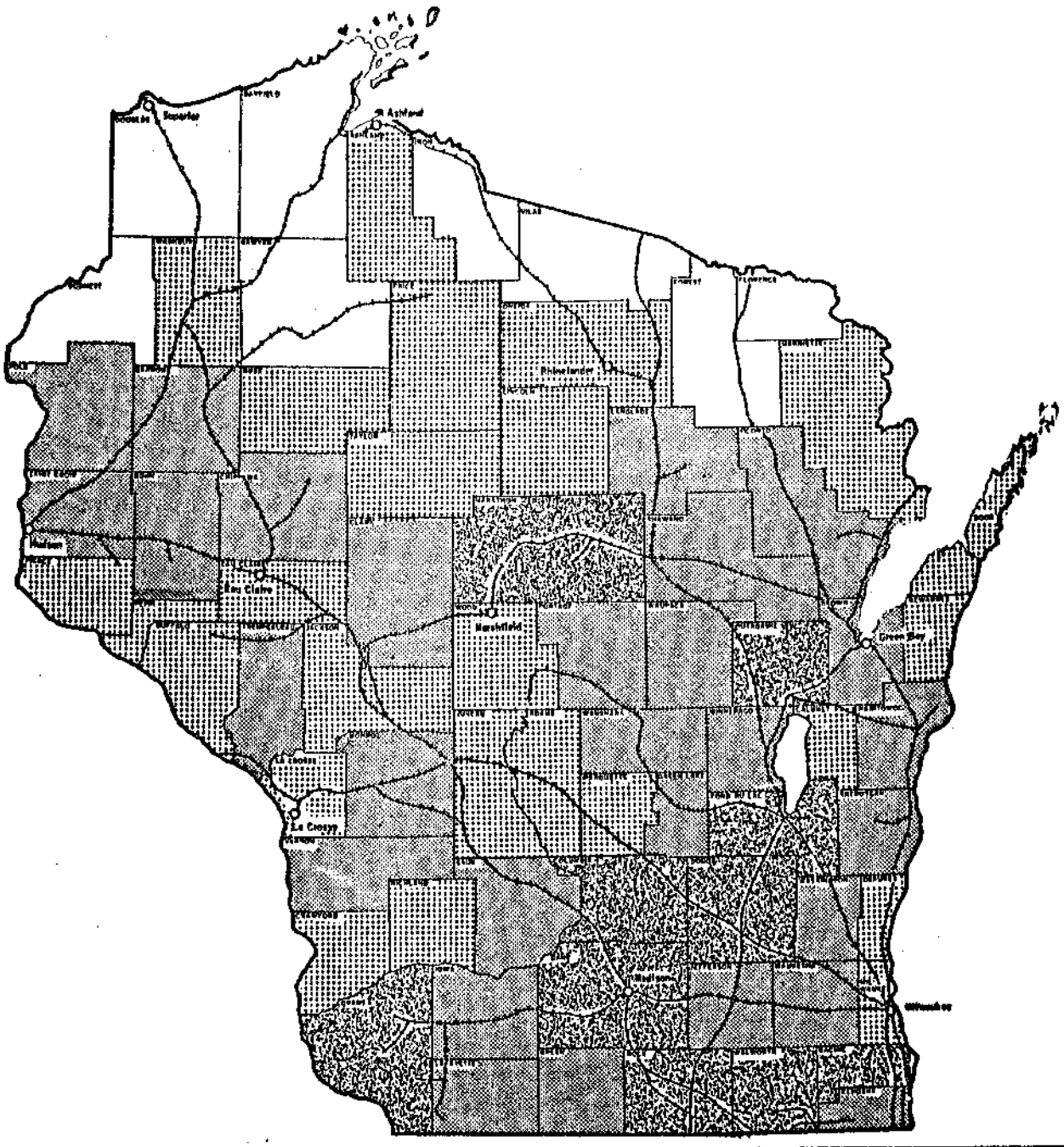
Under 1,000

1,000 - 4,999

5,000 - 9,999

Over 10,000

C&NW Railway



WYOMING

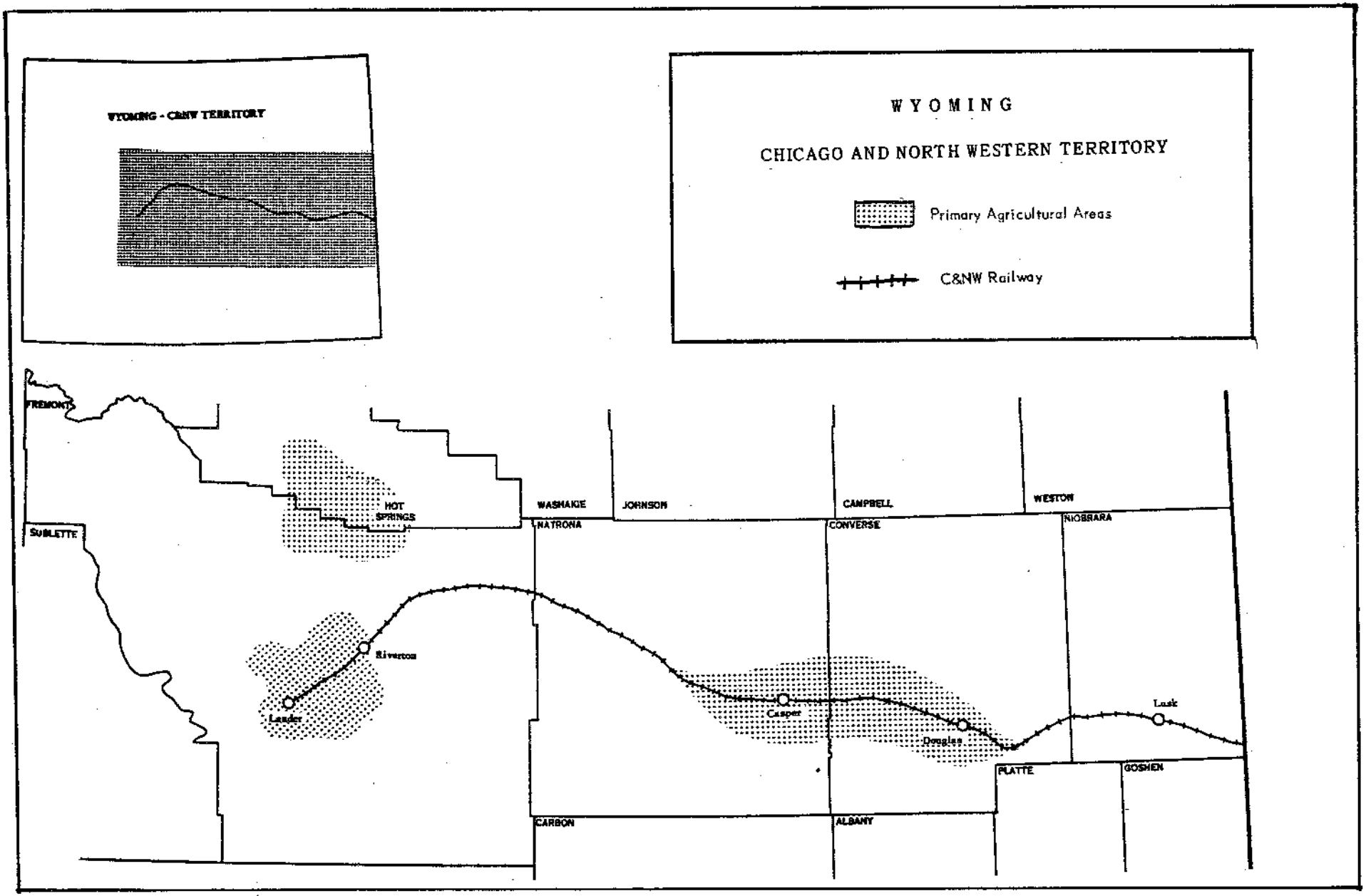
The consumption of commercial fertilizers in Wyoming is very limited because of the small proportion of land area in crop production Usage of all fertilizers during 1957 totaled approximately 10,200 tons. About one fourth of this amount, or 2,700 tons, were superphosphates. Phosphoric acid content of the superphosphates was approximately 43.9 per cent, or 1,192 tons.

The 1,700 tons of mixed fertilizers used contained an estimated 750 tons of superphosphate. Average phosphoric acid content was 19.7 per cent of 330 tons.

WYOMING
CONSUMPTION OF FERTILIZERS CONTAINING SUPERPHOSPHATE
DURING YEAR 1957

Kind of Fertilizer	Estimated Consumption (tons)	Estimated Superphosphate Content (tons)	Estimated Phosphoric Acid Content (tons)
Superphosphates:			
0-20-0	112	112	22
0-45-0	2,601	2,601	1,170
Superphosphate totals	2,713	2,713	1,192
Mixtures:			
Nitrogen-Phosphate	1,000	570	250
Nitrogen-Phosphate-Potash	700	180	80
Mixtures totals	1,700	750	330
Superphosphates and Mixtures totals	4,413	3,463	1,522

Superphosphate sales are concentrated in areas where irrigation is possible and where winter wheat is produced. Principal crops fertilized are wheat, sugar beets, corn and dry beans. These areas are outlined in the map, page 23.


WYOMING - C&NW TERRITORY
WYOMING
CHICAGO AND NORTH WESTERN TERRITORY
Primary Agricultural Areas
C&NW Railway
FREMONT
SUBLETTE
HOT SPRINGS
WASHAKIE
JOHNSON
NATRONA
CAMPBELL
WESTON
CONVERSE
NIOBRARA
Riverton
Lander
Casper
Douglas
Lusk
PLATTE
GOSHEN
CARBON
ALBANY

LIST OF SUPERPHOSPHATE MATERIAL MANUFACTURERS

Allied Chemical Corporation
61 Broadway
New York 6, New York

American Agricultural Chemical Co.
50 Church Street
New York 7, New York

American Cyanamid Co.
30 Rockefeller Plaza
New York 20, New York

American Potash & Chemical Corp.
3000 West Sixth Street
Los Angeles 54, California

Armour Fertilizer Works
350 Hurt Building
P.O. Box 1865
Atlanta 1, Georgia

Ashcraft-Wilkinson Co.
Trust Co. of Georgia Building
Atlanta 3, Georgia

Atkins, Kroll & Co.
417 Montgomery Street
San Francisco 4, California

H. J. Baker & Brother
600 Fifth Avenue
New York 20, New York

Bradley & Baker
155 East 44th Street
New York 17, New York

Consolidated Mining & Smelting Co. of Canada Ltd.
215 St. James St. W.
Montreal, Quebec

Consolidated Rendering Co.
178 Atlantic Avenue
Boxton 10, Massachusetts

Davison Chemical Co.
101 N. Charles Street
Baltimore 3, Maryland

Federal Chemical Co.
610 Starks Building
Louisville, Kentucky

International Commodities Corp.
11 Mercer Street
New York 13, New York

International Minerals & Chemical Corp.
20 N. Wacker Drive
Chicago, Illinois

International Ore & Fertilizer Co.
500 Fifth Avenue
New York 36, New York

Northern Chemical Industries, Inc.
Totman Building
210 E. Redwood Street
Baltimore 2, Maryland

Northwest Nitro-Chemicals Limited
Medicine Hat, Alberta, Canada

Olin Mathieson Chemical Corporation
460 Park Avenue
New York 22, New York

Pacific Chemical & Fertilizer Co.
Honolulu, Hawaii

Phillips Chemical Co.
700 Adams Building
Bartlesville, Oklahoma

Planters Fertilizer & Phosphate Co.
P.O. Box 4857
Charleston Heights, South Carolina

Robertson Chemical Corp.
429 Wainwright Building
P.O. Box 1321
Norfolk 1, Virginia

F. S. Royster Guano Co.
Royster Building
P.O. Box 1940
Norfolk 1, Virginia

Smith-Douglas Co. Inc.
5100 Virginia Beach Blvd.
Norfolk 1, Virginia

Swift and Company
Union Stock Yards
Chicago 9, Illinois

Summers Fertilizer Co. Inc.
210 E. Redwood Street
Totman Building
Baltimore 2, Maryland

Tennessee Corporation
61 Broadway
New York 6, New York

U. S. Phosphoric Products Division
Division of Tennessee Corp.
P.O. Box 3269
Tampa, Florida

Virginia-Carolina Chemical Corp.
401 East Main Street
Richmond 8, Virginia

Victor Chemicals
155 N. Wacker Drive
Chicago 6, Illinois

Wilson & Toomer Fertilizer Co.
P.O. Box 4459
Jacksonville 1, Florida

Wilson & George Mayer & Co.
Intermountain
73 S. Main Street
Salt Lake City, Utah

Woodward & Dickerson, Inc.
1400 South Penn Square
Philadelphia 2, Pennsylvania

LIST OF SULFURIC ACID MANUFACTURERS

Allied Chemical Corporation
61 Broadway
New York 6, New York

American Agricultural Chemical Co.
50 Church Street
New York 7, New York

Armour Fertilizer Works
350 Hurt Building
P.O. Box 1865
Atlanta 1, Georgia

Ashcraft-Wilkinson Co.
Trust Co. of Georgia Building
Atlanta 3, Georgia

Consolidated Mining & Smelting Co. of Canada Ltd.
215 St. James St. W.
Montreal, Quebec

Davison Chemical Co.
101 N. Charles Street
Baltimore 3, Maryland

Dixon Chemical and Research Inc.
1260 Broad Street
Bloomfield, New Jersey

The Eagle-Picher Co.
American Building
Cincinnati 1, Ohio

International Commodities Corp.
11 Mercer Street
New York 13, New York

International Minerals & Chemical Corp.
20 N. Wacker Drive
Chicago 6, Illinois

Monsanto Chemical Co.
710 N. 12th Boulevard
St. Louis 1, Missouri

Northern Chemical Industries, Inc.
Totman Building
210 E. Redwood Street
Baltimore 2, Maryland

Olin Mathieson Chemical Corporation
460 Park Avenue
New York 22, New York

Pacific Chemical & Fertilizer Co.
Honolulu, Hawaii

Planters Fertilizer & Phosphate Co.
P.O. Box 4857
Charleston Heights, South Carolina

Robertson Chemical Corp.
429 Wainwright Building
P.O. Box 1321
Norfolk 1, Virginia

F. S. Royster Guano Co.
Royster Building
P.O. Box 1940
Norfolk 1, Virginia

Summers Fertilizer Company, Inc.
Totman Building
210 E. Redwood Street
Baltimore 2, Maryland

Tennessee Corporation
617 - 29 Grant Building
P.O. Box 2205
Atlanta 1, Georgia

U. S. Industrial Chemicals Corp.
99 Park Avenue
New York 16, New York

Wilson & Toomer Fertilizer Co.
P.O. Box 4459
Jacksonville 1, Florida

REFERENCES

1. Commercial Fertilizer and Plant Food Industry. Commercial fertilizer Year Book 1957. Vol. 95 No. 3 A. 75 Third Street, N. W., Atlanta 8, Georgia.

2. Iowa State Department of Agriculture. Distribution of fertilizer sales by counties, 1957 and 1958. Des Moines, Iowa.

3. Minnesota Agricultural Extension Service. Cash expenses of Minnesota farmers, county data. University of Minnesota. St. Paul, Minnesota.

4. Nebraska Department of Agriculture and Inspection. Nebraska Agricultural statistics annual report 1957. Lincoln, Nebraska.

5. U. S. Department of Agriculture. 1954 census of agriculture. Vol. 1, Pt. 5. Washington, D. C.

6. Wisconsin State Department of Agriculture. Commercial fertilizers 1958 and 1959, Bulletin No. 345. Madison, Wisconsin.

7. Wisconsin State Department of Agriculture. Economic changes affecting farm fertilizer use. Special bulletin No. 24. Madison, Wisconsin.

8. Wyoming Department of Agriculture, Division of Markets. Wyoming fertilizer tonnage report 1952 through 1958. Cheyenne, Wyoming.

This is a publication of the

Agricultural and Resource Development Department
Chicago and North Western Railway Company
400 West Madison Street
Chicago 6, Illinois

W. A. Kluender, Director

R. J. Hill, Agriculturist
Chicago

C. R. Batten, Forester
St. Paul

R. E. Lucas, Agricultural Economist
Chicago

E. B. Huedepohl, Geologist
Chicago

Resource Publication No. 110
Chicago, Illinois
July 1, 1959

Price: $1.00

EMPIRE of RESOURCES and INDUSTRY

● Once known primarily as a grower of foodstuffs, this rich mid-western empire now proudly ranks its vast and diverse industrial production on a par with its agriculture. Good transportation is a vital part of this development in a land whose future shows even greater promise, for within its boundaries still lie untold riches in natural resources.

CHICAGO and NORTH WESTERN RAILWAY

CODE NUMBER
MI-PHO-WYO
014-06-59

PHOSPHATE RESOURCES -- WEST-CENTRAL WYOMING

DESCRIPTION: A formation containing beds of phosphate rock occurs along the northeast flank of the Wind River Mountains in west-central Wyoming. This formation is called the Phosphoria, its name being derived from the phosphate content of some of its component beds. The Phosphoria in this area is 280-290 feet thick and dips to the northeast at angles from 5 to 40 degrees.

Two zones of phosphate rock are included in the formation. These zones vary in thickness and phosphate content and each contains, in most cases, a bed where much of the phosphate content is concentrated. The primary bed in the lower zone is generally 1 to 4 feet thick and is located some 40 feet above the base of the formation. In some locations this bed is as much as 7 or 8 feet thick. The primary bed in the upper zone is usually 3 to 6 feet thick and is located roughly 140 feet above the lower bed.

The phosphate beds consist mainly of low-grade rock. The lower bed has an average P_2O_5 content of about 22 per cent, with some higher grade rock found. The upper bed has an average P_2O_5 content of only 17 per cent. The phosphate rock is generally dark gray to black in color and frequently has an oily odor when broken.

LOCATION: The town of Lander, Wyoming, western terminus of the Chicago and North Western Railway, lies about 5 miles northeast of the outcrop line of the Phosphoria. The formation extends northwest and southeast along the Wind River Mountains from the Lander area for a total distance of more than 90 miles.

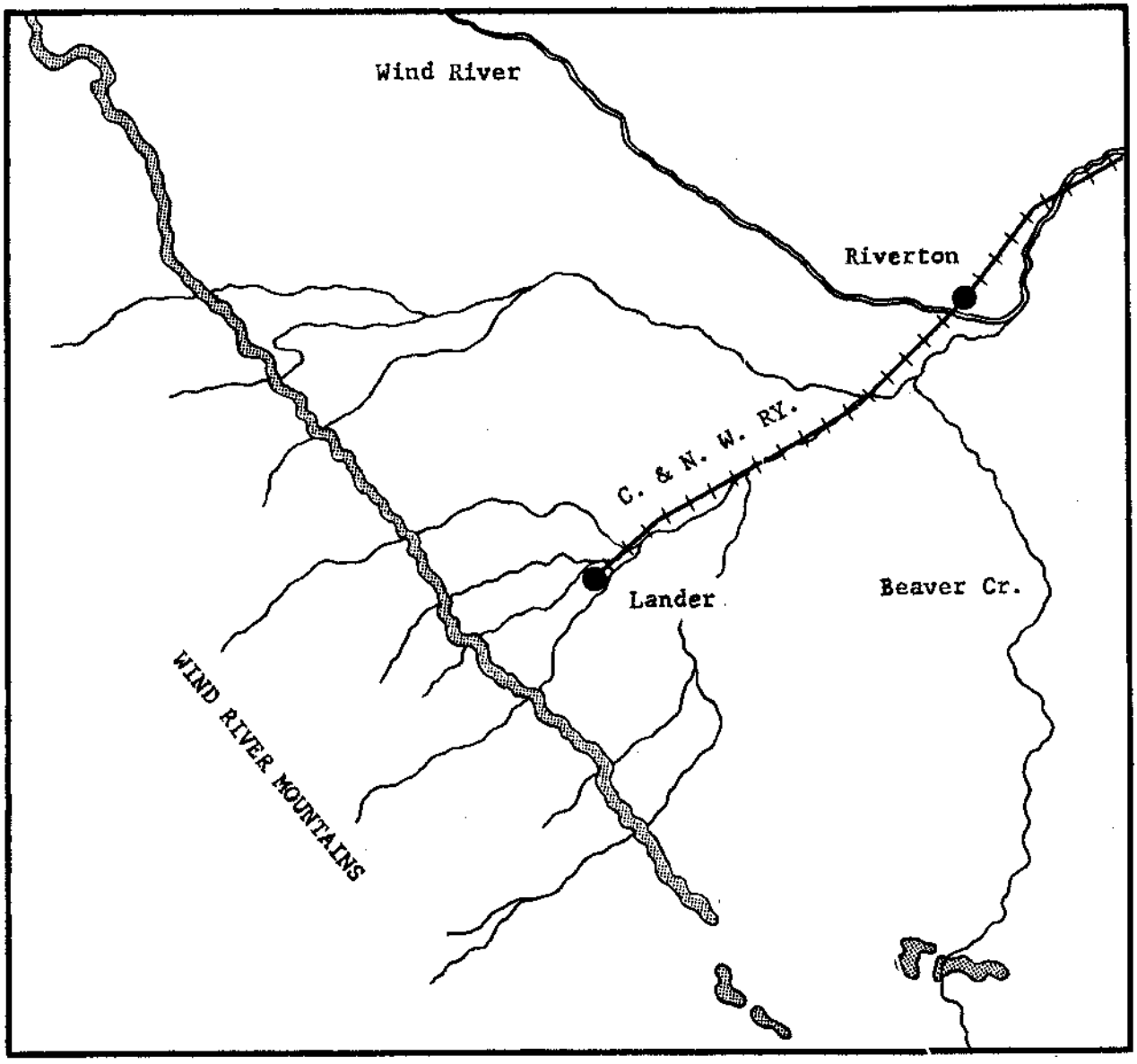
DEVELOPMENT: There has been no commercial development of the phosphate beds of west-central Wyoming. Many of the regions in which the formation outcrops are mountainous and nearly inaccessible, particularly northwest of Lander. Little information is available concerning the Phosphoria in these regions. The low grade of the accessible phosphate rock has discouraged development of the beds for fertilizer manufacture and other uses. The probability of high mining costs also has been an unfavorable factor. With the development of new and improved methods in mining and ore processing, the phosphate beds of this area are now being reconsidered as possible sources of fertilizer and phosphorus.

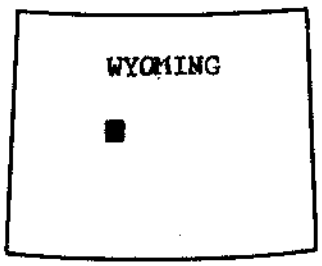
EBH fb

Write for additional information. Mention above code number.
Agricultural and Resource Development Department
Chicago and North Western Railway Company
400 West Madison St., Chicago 6, Ill.

(over)

PHOSPHATE DEPOSITS - - WEST-CENTRAL WYOMING





Areas of Phosphate Rock Occurrences

Scale 0 10 Miles