A SURVEY

OF

TIMBER RESOURCES

THE STATE OF IOWA

FOR

PULP MILLS

VENEER & PLYWOOD PLANTS

AND OTHER

WOOD USING PLANTS

REPORT TO IOWA DEVELOPMENT COMMISSION

JANUARY 1968

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FORESTRY CONSULTANTS

LELAND, MISSISSIPPI
38756

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ACKNOWLEDGEMENT

The Iowa Development Commission asked that a study be made of timber resources available to Iowa forest industry and this factual report has been compiled.

Acknowledgement is made of the basic information furnished in the report titled "The Forest Resources of Iowa" which was produced in 1959 as a cooperative effort by the Central States Forest Experiment Station at Columbus, Ohio, the Lake States Experiment Station at St. Paul, Minnesota, and State Agencies. This survey was the first intensive inventory of forests in Iowa.

Recent survey data of 1962 supplied by the North Central Forest Experiment Station relative to studies of the Mississippi and Missouri River Basins has provided an accurate appraisal of the original survey data and measurements for the 10 year period of 1953 to 1962.

The State Conservation Commission has provided statistics on forested lands within the major districts and also cooperated with the DeWeese Operations Division of the Weyerhaeuser Company on the study of hickory bolts.

Appreciation is expressed to members of other firms who have been helpful in making this study of forest resources and of the wood products industry.

FOREWARD

Iowa timber growth and the related forest industry is following the same pattern of other regions in that after the virgin forests were cut over, the large plants were moved to the south and west. This has permitted the second growth hardwood timber stands to develop, and the remaining virgin grade stands of timber to mature. The state of Iowa is known for its fine agricultural crops but during the past several years has failed to receive due credit for the timber products which are being grown and marketed.

From an industrial point of view there is sufficient gross volume of timber to be found in each of the major subregions of Iowa to justify the establishment of several forest industrial plants to utilize the respective forest products. Survey data in every case has proven an increasing gain in volume since the original field work in 1953 and 1954. Veneer grade logs, sawlogs, stave material and flooring are being shipped out of the state annually for processing at other industrial sites, but if the present timber resources were processed within the state of Iowa, the additional forest industry would provide for a very firm foundation of an industrial and economic growth of the state. It would provide new jobs for high school and college graduates, create wealth within local communities, and generally improve the economic standards of a wide area adjacent to the new plants.

Industrially, Iowa has the advantage of being bounded on the east by the Mississippi River and on the west by the Missouri River thereby guaranteeing to industry a supply of water without reservation. Within the state, the Des Moines river provides a supply of water which normally will meet the needs of any industrial plant. Power through the use of electricity is to be found as an unlimited commodity throughout the state even though produced by comparatively small plants and is supplemented by fuel reserves which will care for the requirements of plants associated with the forest industry. In addition to the barging facilities on both the Mississippi and Missouri Rivers, railroads provide Iowa with a most complete system of transporation and Iowa highways are recognized for their superior coverage of the state.

A reconnaissance of the log supplies throughout the state indicates that the average size of logs being harvested is entirely satisfactory and generally larger in diameter than the size of logs being manufactured in other states. The grade and species of hardwood timber are to be given increased consideration due to the emphasis which has been placed upon greater utilization of the hard hardwood species by industry.

The volume of standing timber, usable for lumber, veneer, pulpwood and other products is increasing at a faster rate than it is being harvested because of:

1. The growth and ingrowth on fertile land with adequate rainfall provides for a good annual volume increment within each stand classification.

2. Interest in forest lands is increasing and as a result of this increased interest, landowners have learned to call upon representatives of the State Conservation Commission, and other agencies for advice and assistance.

The publicity which has been given to Iowa walnut species has aroused the interest of persons in all fields as choice logs are being sold by grade in excess of $1.00 per board foot. The return to the oil rich black walnut furniture has been a return to elegance whereby solid walnut and walnut veneer furniture are being constructed with supplemental parts of other well known woods such as solid mahogany.

It is visualized that this hardwood area will become a more prominent producer of choice hardwood products during the next several years in order to meet the demand created by the large increase in population. Additional local market facilities will be necessary in order to utilize the increasingly large volume of low grade forest products as well as choice logs.

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INTRODUCTION

This survey consists of a study of forest resources of the state of Iowa and reflects an industrial point of view concerning the utilization of forest products. The immediate area is part of the hardwood region included in the north central states and is divided between the Mississippi and Missouri River Basins. The total volume of both hard and soft hardwood species can be supplemented by large quantities of pine and softwood timber readily available from western or northern states. It is obvious that there will be a necessary expansion of paper and related industries throughout the world and this development will require the proper utilization of available timber fibers for this purpose.

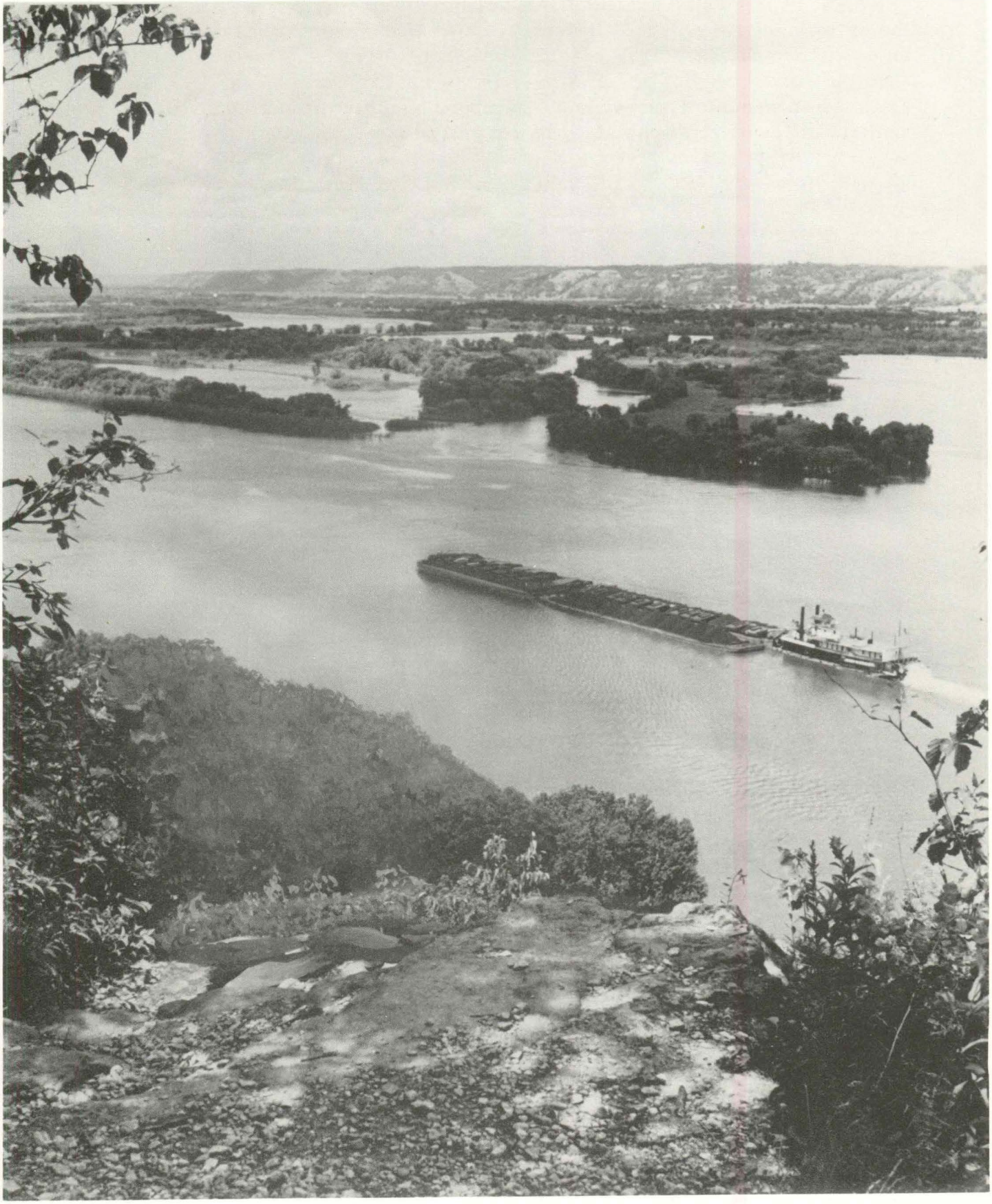
Black walnut, red oak, white oak, maple, and other species of veneer grade quality are grown in sufficient quantities to permit economical harvesting, and in addition to the production of choice logs of selected species, large quanities of material suitable for chipping deserve special recognition.

The supply of material has been found to be increasing annually and should prove to be of interest to forest industries which have need of raw material.

Recent studies of the Mississippi and Missouri River Basins clearly indicate that in addition to the volume of timber present in Iowa and on the subregions adjoining Iowa, the annual growth is at least three times greater than the annual cut. It is estimated that the annual growth in western Iowa and eastern Nebraska is four times greater than the annual cut.

The availability of pulpwood, shaving or chip material, sawlogs and veneer logs has been confirmed following a reconnaissance of representative forested areas within the state and a study of statistics for the entire state of Iowa provided by federal agencies and state personnel. Basic records for the state of Iowa consist of 1953 survey data published in the Forest Survey Release titled The Forest Resources of Iowa. Since this time data covering the past fifteen years consistently indicates that the annual growth of the hard and soft hardwood material substantially exceeds the harvest in all sections of the state.

The counties in the northeastern section of Iowa individually contain the greatest timber acreage and the largest quantity of timber of all kinds. However, economic transportation facilities by truck, railroad, or barge can be provided so that potential industrial sites have been indicated as being acceptable not only throughout the Mississippi River frontage, but also in selected areas in the central portion of the state and on the Missouri River. A suitable site for a pulpmill is more exacting due to the requirement of an adequate supply of water for process use and affluent dilutions. Plant sites for veneer and other wood product plants are less exacting and can be determined in accordance with the respective companies' best interest.



The local use of forest products is exceedingly high within the state and throughout the entire midwest area. Shipments of raw material for processing can be made on an economical basis to Iowa due to reasonable rates.

Finished or manufactured products may be transported to northern and eastern markets at low cost as the state is centrally located.

RECOMMENDATIONS AND CONCLUSIONS

Additional forest industry is recommended for each of the three economic subregions of Iowa as wood using industries are needed to provide a market for the timber which is presently found throughout the state. The landowners have need of markets for products from lands designated as forest lands in order to justify the ownership of these acres and payment of annual taxes.

Minimum size pulp mills and other plants are recommended for each subregion for the production of the following products:

1. Pulp, hardboard or flakeboard
2. Pallets
3. Plywood and veneer
4. Staves
5. Furniture and dimension stock
6. Flooring
7. Cedar products
8. Shavings

Preliminary investigation indicates that pulp mills or related industries may be established on the Missouri River at Council Bluffs; on the Des Moines River at Ottumwa and Keokuk; and on the Mississippi River at several locations including Allamakee County. These suggested plant sites will provide all of the facilities needed by a minimum sized pulp mill and also be capable of caring for expansion programs in line with the availability of timber resources.

Of further consideration, there is available to each subregion quantities of material which would permit the practical operation of Hardwood Utilization Centers in which the pulp and wood chipping plants provide the major industry within the area where they are located and furnish a market for woods residue and plant residue.

Full use of some adaptation of utilization centers to provide for economical harvesting of choice or veneer grade logs, sawlogs, tie logs, stave or furniture stock and pulpwood should prove particularly advantageous to Iowa's industrial units due to the extremely diversified nature and distribution of the timber. There is a large supply of raw material available to industry provided it can be transported economically to designated plant sites following the production of wood products by the most modern means of mechanization. Emphasis may

be placed on the use of small logging units which are capable of keeping costs at a minimum in the production, yarding and loading, and transportation of raw materials.

Veneer plants of minimum size can be supplied with high grade logs or bolts in each of the subregions and may be considered as one of the units to be included in a utilization center. Pallet plants may be included as one of the essential units of a center as the pallet business is developing with mechanization and tends to become one of the major industries. The production of material in tree lengths will supply a sawmill with tie and lumber grade logs and a pulp mill with roundwood normally left in the woods as residue. Furniture or industrial dimension plants make full use of short logs (less than 8' in length) of high quality thereby providing an excellent market for choice material which is normally classified as sound culls in forest inventories.

It is possible for a single wood procurement organization to economically provide raw material for several plants and the plants may be located reasonable close in order to share or cooperate on the following items:

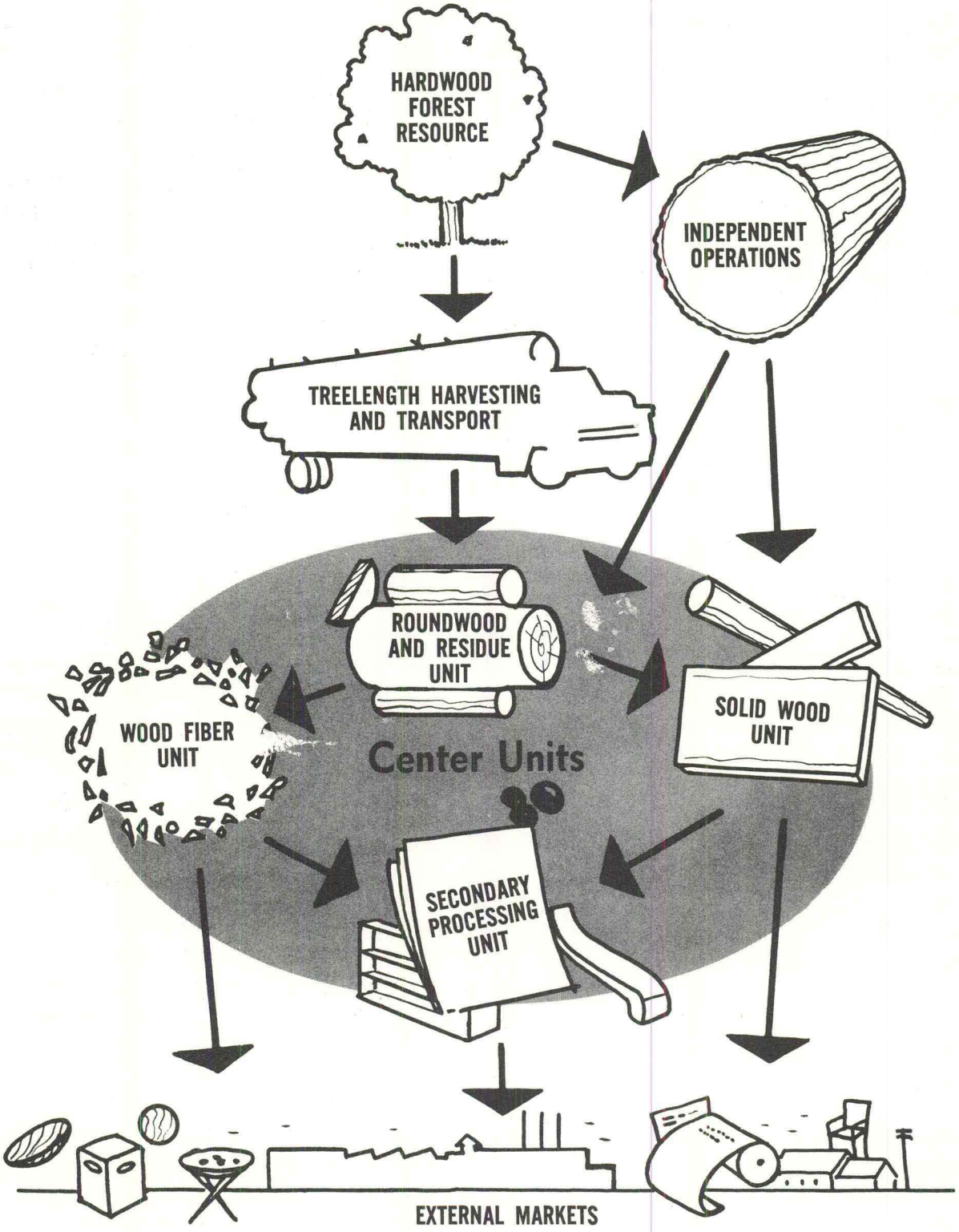
1. Production and transportation of raw material.
2. Provide local and nationwide markets.
3. Purchase equipment and supplies.

Improved mechanical means of harvesting and transporting tree length material provides a procurement department with an opportunity to increase the radius of its operation. Freight rates on both inbound and outbound shipments are lower because of the greater volume of traffic to and from a center. This reduction in transportation costs is an important advantage since transportation is commonly acknowledged as the major cost factor in wood product manufacturing. The purchasing of timber may be made on a woodsrun basis including all grades and species of timber because a center may use mixed hardwoods of all grades. The sorting of the wood products for the individual industrial units may be done at a centrally located yard.

Other features in favor of some form of organization within the timber industry include such factors as less capital is required by a dimension manufacturer in an integrated center as he does not have to maintain a lumber inventory with a sawmill next door. Organization is stressed because work capital costs may be reduced by 25% or more and the total cost of raw material may be reduced from 10 to 20%.

The availability of the individual market outlets within a center is especially advantageous as a pulp plant would provide an internal market for all of the plant residue. The cost of equipment and supplies can be shared by the individual units of a center. Loading facilities for external markets and local transportation between plants can be shared. A utilization center offers more complete manufacturing and utilization of the forest resources. The cost of power, transportation, capital and labor is a major factor of forest industry in

HARDWOOD UTILIZATION CENTER
Basic Flow Chart



SOURCE: Tennessee Valley Authority, Division of Forestry Development.

today's highly competative business world. The cost of transportation would be less if the plants were close together and special freight rates could be negotiated because of the large volume of business. Labor is more stable in a center and excess labor in one plant can usually be utilized in another unit. Power is furnished a center at a cheaper rate because of the large amount used.

Examples of hardwood centers that have been developed are listed as follows:

1. Weyerhaeuser Company at Marshfield, Wisconsin.
2. West Virginia Pulp and Paper Company at Tyrone, Penna.
3. International Paper Company at Gatineau, Quebec.

Advanced mechanization is most appropriate to the state of Iowa as the average employee has been educated to a degree well above the national average and able to handle equipment designed to produce maximum quantities of wood products on a piece or unit basis. Iowa labor is to be rated high on the basis of skill and operation thereby more than justifying the pay scales which are proving to be a problem in other regions of the United States.

The planting of shelterbelts, old fields, and other sites with species of trees suitable for commercial use should be encouraged as the tree farming program throughout the state of Iowa has steadily improved under the direction of members of the State Conservation Commission. Walnut and veneer grade species of trees can be harvested economically from small lots which yield the minimum of logs per acre and pulpwood and other products can be economically harvested through a thinning or timber stand improvement operation from woodlots providing a larger gross volume per acre. Individual tree values increase at an entirely satisfactory rate and even small plots of land which contain a reasonable stocking of trees can produce an annual per acre income which well justifies full consideration of the landowner.

The continued education of the Iowa farmers and landowners on the increasing value of timber crops is imperative to demonstrate that timber management will provide a comparative yield to approach the income received from the more fertile lands which have been developed for crops and pasture. Landowners including bankers, lawyers, doctors, farmers, and others have a tendency to overlook the possibility of securing the full returns from the growing and marketing of their timber crops. Education may be strengthened by the employment of additional foresters stationed in the more heavily forested counties in each State Forestry District.

Information on the value of timber products and forested lands is provided students who attend the Agricultural College of Iowa State University at Ames, Iowa. Tree planting has been encouraged since 1872 and cottonwood, elm, ash, box elder, mulberry and maple thrived in the earlier plantings for windbreaks, shelterbelts, and shade.

The data provided in this report is believed to be conservative in view of the greater utilization of woodsrun material by industry. This trend in the use and acceptance of lower grade material and all species of mixed hardwoods will continue and in certain wood products, sound defects will be accepted without great prejudice.

This information is based upon an initial survey of Iowa by the Central States Forest Experiment Station and reported upon by the publication titled The Forest Resources of Iowa dated 1959. The field inventory of the forests of Iowa was made during the period from November 1953 to August 1954. This was the first complete survey made in Iowa but it has been proven that the facts presented in this publication are entirely accurate within reason by the comparison of this report with unpublished data on the Mississippi and Missouri River Basins presently being compiled by the North Central Forest Experiment Station. This inventory was made in 1962.

Allowance has been made in the 1962 survey data for the excessive mortality within the elm species as the result of dutch elm disease. The full extent of the mortality losses due to this disease within respective elm species cannot be accurately calculated but the 1954 data listed the volume of elm as a major species whereas the 1962 survey and the projections of volumes give elm only consideration as "other hardwoods".

The commercial forest area continues to be considered as 2,600,000 acres, more or less, as surveyed in 1953. This total land acreage may be slightly high due to the recent clearing of bottomland areas along the major streams for conversion into croplands. A possible decrease in forest area is contrary to the increase in acreage for the period 1954-1963 as records indicate that for 1945 there was only 2,250,000 acres of forest land.

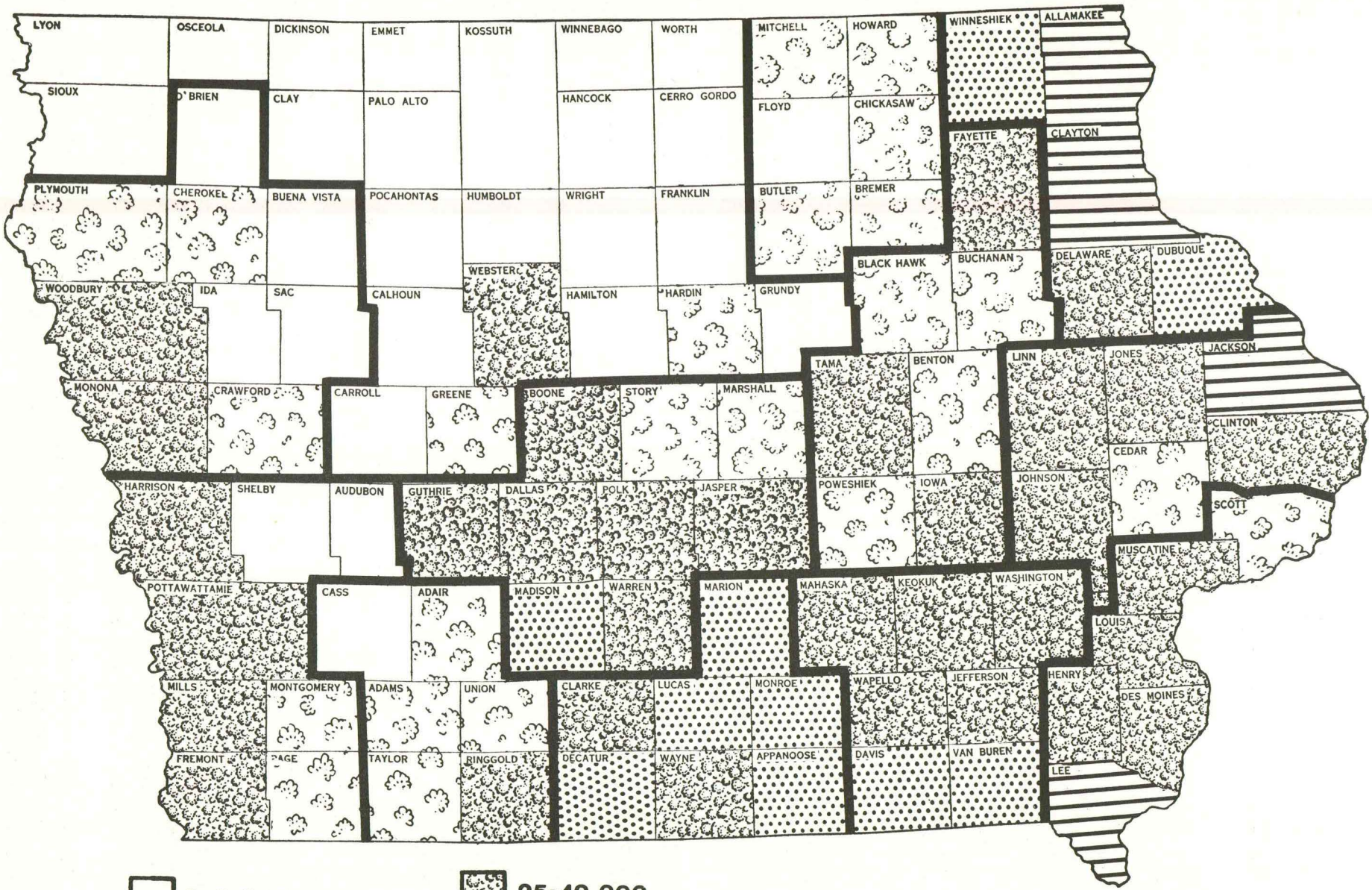
Any loss of forest area in the bottomlands is at least partially balanced by open or pasture lands reverting to forest. This is partly due to the decrease in the grazing of woodlands by farmers who have learned to confine their cattle and hogs to feed lots or improved pastures. One example of improvement of the forest area is that the hill lands in western Iowa are now supporting growing stands of the bur oak species.

Additional clearing of the forest area is not anticipated as more than 85% of lands comprised as forest area in 1953 is comprised of rough upland, stream beds, and other acreage not to be considered as desirable for improved pasture or cropland.

There is an additional acreage of 664,000 acres of wooded areas consisting of wooded strips of less than 120' wide or less than one acre. No consideration in the volume estimates, including growing stock, has been given to the

FOREST AREA BY COUNTIES, WITHIN EACH FORESTRY DISTRICT.

FOREST LAND ACREAGE TOTALS APPROXIMATELY 2.6 MILLION ACRES.



— Acreage Forested —

volumes found in these natural or planted strips. Attention is called to this large acreage because in 1953, 40% of the land was in sawtimber stands having a minimum net volume per acre of 1500 board feet (International 1/4" rule). 1/

Timber resources estimated for the state of Iowa as of January 1, 1968 include nearly 7,000,000,000 board feet of sawtimber alone and a cubic volume of growing stock of more than 1,808,000,000. Additional cubic foot volume distributed throughout the state within each survey region includes 7,651,000 cords in the form of other material.

The following chart provides the volumes within each economic survey region:

STATE OF IOWA - 1968
(Commercial forest area of 2,600,000 acres, more or less)

	GROWING STOCK (cubic feet)	SAWTIMBER (Only) (board feet)
Northeastern Survey Region	737,700,000	2,915,000,000
Southeastern Survey Region	619,200,000	2,213,000,000
Western Survey Region	451,500,000	1,809,000,000
Total	1,808,400,000	6,937,000,000

Cubic foot volumes pertaining to cull trees, and topwood amounted to more than 600,000,000 cubic feet in 1954 and this volume may be considered subject to salvage in Iowa woodlands and merchantable relative to use by the pulp or related industries. No increase has been made of this cubic foot volume except for short butt logs.

Special consideration should be given by the woods product industry to material contained in short butt logs (less than 8' in length) and tallied in the form of sound cull trees in forest inventories. In 1968, it is estimated that the butt logs contain more than 500,000,000 board feet of timber for the state of Iowa. Utilization by furniture or dimension stock plants and stave plants places a value on the short butt logs which greatly exceeds normal values placed on salvable material. Much of this volume is contained in the red and white oak species for which the demand has been strengthened as the use of oak in furniture has been revived by manufacturers of office and household equipment who were favoring the use of mahogany and other imported wood products.

1/ U. S. Department of Agriculture, Forest Service, Forest Survey Release Number 21 titled Wooded Strips in Iowa - 1956

A reversal of logging procedures whereby wood products are harvested in accordance with practical timber stand improvement measures would completely upset any projection of growth relative to annual utilization and allowable annual cut. The substitution of sound culls and less desirable species for trees classified as growing stock would provide certain units of industry with their requirements and permit crop trees to be retained on the forest land areas for growth. The grade of trees improves as the diameters increase.

STATE OF IOWA - 1978
(Commercial forest area of 2,600,000 acres, more or less)

Based upon net growing stock as of January 1, 1968 at the rate of increase of 2.5% per year.

	GROWING STOCK (cubic feet)	SAWTIMBER (board feet)
Northeastern Survey Region	922,125,000	3,643,750,000
Southeastern Survey Region	774,000,000	2,766,250,000
Western Survey Region	586,875,000	2,261,250,000
Total	2,283,000,000	8,671,250,000

It is recommended that forest industry be established in each of the three economic subregions of Iowa in order to provide a market for woods products throughout the entire state. It has been determined that within each subregion and the adjoining states that there is sufficient timber available annually to provide for the requirements of a pulp mill, veneer plant, several furniture and dimension stock plants and other units of the forest industry without depleting the residual stands of timber. These industries may be established individually or may be organized in some form of a Hardwood Utilization Center which would prove economically beneficial to the participants.

The stumpage prices paid for stave or dimension stock or veneer logs exceed the unit prices paid for sawlog or pulpwood material so that, although only the select portions of the butt log are utilized, the landowner will gain through the marketing of these specialty items. Topwood and upper stem portions may exceed the cubic foot volumes utilized but are presently being left in the woods.

Representative stumpage prices paid for Iowa timber

The table following is a compilation of price ranges that were effective in the Iowa timber markets during November 1967.

Sawlog Quality

Species	Stumpage Price/1000 Bd. Ft.			Delivered Price/1000 Bd. Ft.		
	Low	Ave.	High	Low	Ave.	High
Walnut	$50	$70	$100	(80)	120	200
Red Oak	10	15	25	30	55	150
White Oak	5	25	60	35	45	70
Elm	5	10	15	30	55	200
Soft Maple	5	20	50	35	60	150
Hickory	10	10	10	30	50	150
Cottonwood	5	10	15	30	35	40
Butternut	-	-	-	85	85	85
Cherry	-	-	-	75	75	75
Ash	-	-	-	-	-	-
Basswood	-	-	-	-	-	-
Hard Maple	-	-	-	-	-	-

Veneer Quality

Walnut	200	660	1500	300	840	1600
Red Oak	30	45	60	55	85	110
Soft Maple	30	40	60	55	70	80
Basswood	-	-	-	150	70	80
Butternut	-	-	-	275	410	550
Cherry	-	-	-	125	190	250

Source: David W. Countryman, Cooperative Extension Service, Iowa State University of Science and Technology, Ames, Iowa December, 1967.

The private owners account for more than 98.5% of the total commercial forest land and the following chart indicates the distribution of Iowa forest land.

Ownership of Iowa Forest Lands 1/

	Thousand Acres	Percent of Total
Private (Farm woodlots or shelterbelts)	2,282.1	87.9
Industrial and other non-farm	276.1	10.6
Total	2,558.2	98.5
Other Owners	36.8	1.5
Total	2,595.0	100.0

1/ U. S. Department of Agriculture, Forest Service, Forest Survey Release Number 22, The Forest Resources of Iowa, 1959.

Mechanical handling coupled with water transportation may reduce log procurement cost as much as $5.00 per thousand.

The average farm woodland acreage is 45 acres and this acreage represents 25.6% of the average farm:

Iowa Farm Woodlots 1/

Total number of farms	193,000
Number of farms having woodlots	48,000
Acreage of average farm	176.5
Average woodland acreage of farms having woodlots	45
Percentage of average farm in woodland	25.6

The character of the individual woodland tracts varies from stands of large trees growing in open park like stands to heavily overcut stands containing only unmerchantable sizes of reproduction. It has been proven that upon the initiation of practical management of forested lands, timber stand improvement measures yielded per acre volumes that could be harvested economically while leaving crop trees to grow.

An analysis of the timber resources of Iowa clearly indicates that the wood products are not being fully utilized and there is need for additional forest industry. The annual growth and cut in Iowa is illustrated as follows:

1962 Survey Data 2/

	GROWING STOCK (cubic feet)	SAWTIMBER (board feet)
Growth	50,000,000	217,000,000
Cut	14,985,000	74,583,000
Inventory Increase	35,015,000*	142,417,000

*Does not provide credit for the utilization of sound culls and woods residue.

The growth exceeded the cut in growing stock classification by 35,015,000 cubic feet and the sawtimber stands increased in volume by 142,417,000 board feet for this year.

1/ U. S. Department of Agriculture, Forest Service, Forest Survey Release Number 22, The Forest Resources of Iowa, 1959.

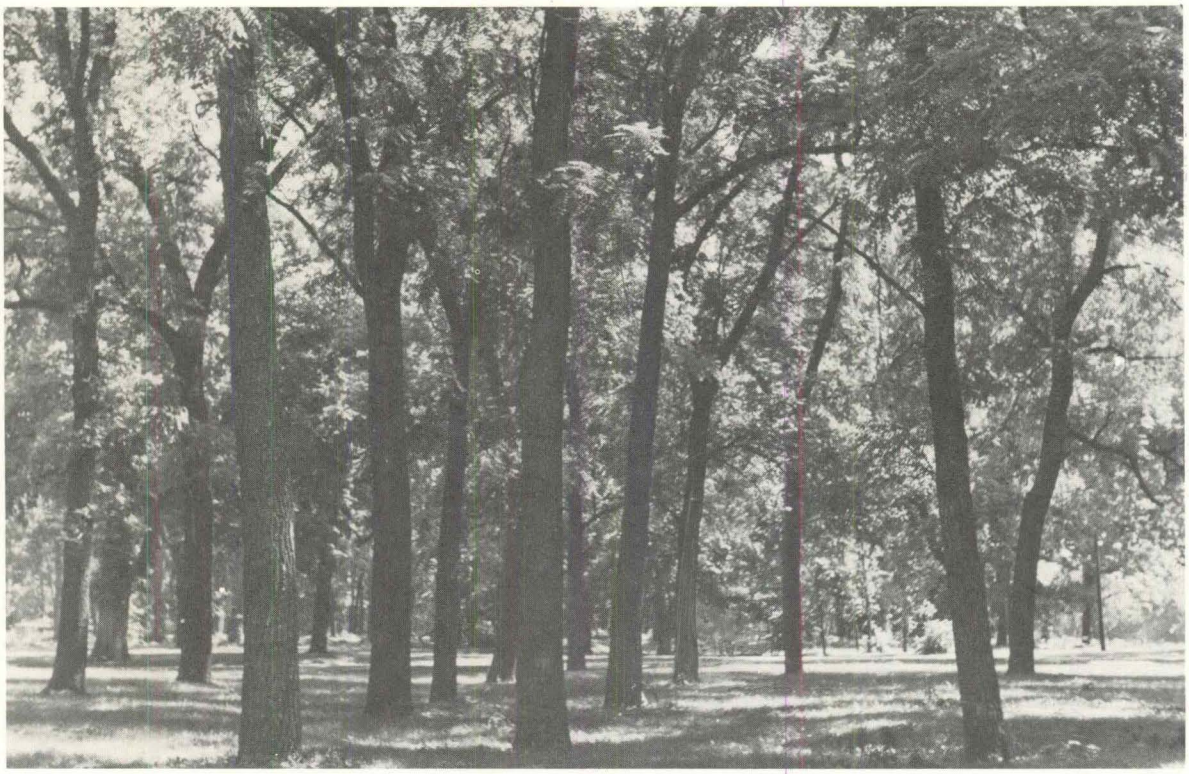
2/ Missouri River Basin Study and the Mississippi River Basin Study to be published by the U. S. Corps of Engineers, Data prepared by North Central Forest Experiment Station.

I

II

Class I—The presence of all diameter classes from reproduction upward is the outstanding characteristic of Class I woodlands.

Class II—The almost total absence of trees of reproduction size, but an otherwise good distribution of size classes, characterizes Class II stands.

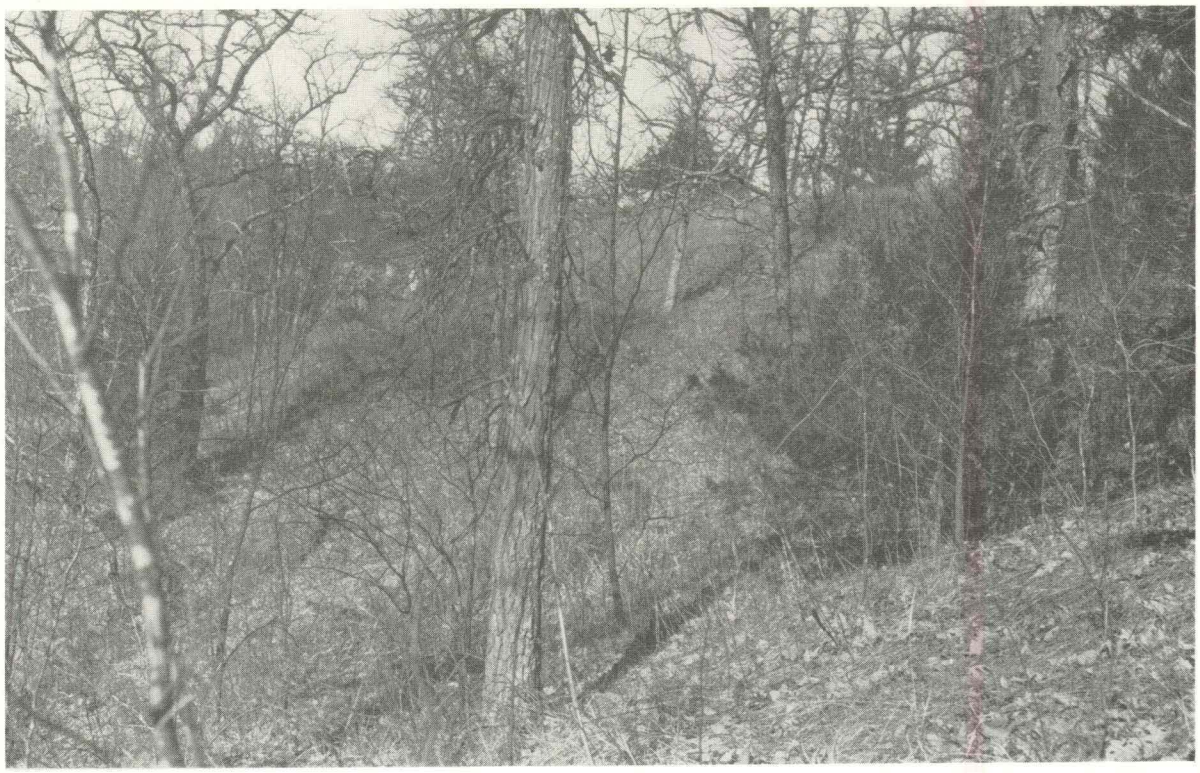


III

IV

Class III—Features which distinguish Class III woodlands are: the open condition of the stands, the presence of sod on the forest floor, and the preponderance of trees in the larger diameter classes.

Class IV—Well-stocked stands made up almost exclusively of pole-size trees are called Class IV.



V

VI

Class V—Poorly stocked pole stands are called Class V. Grass sod is usually present in the openings.

Class VI—Pole stands with from 6 to 18 larger trees per acre in the overstory are characteristic Class VI woodlands.

VII

VIII

Class VII—Definite two-storied forests caused by the absence of one or more diameter classes of pole size are called Class VII.

Class VIII—Trees of reproduction size, originating either from clear-cut stands or volunteer growth on abandoned fields, are mapped as Class VIII.

COMPARISON TABLE - 1963

FOR SELECTED SUBREGIONS OF THE UPPER MISSISSIPPI & MISSOURI RIVER BASINS

Volume of sawtimber present in 1963 by subregions, and a comparison of the annual growth for 1962 with the annual cut for 1962.

	Mississippi River Basin		Missouri River Basin
	Des Moines-Fort Dodge Subregion III	Davenport-Moline Subregion IV	Western Iowa-Eastern Nebraska 1/ Subregion 6
	(Thousand board feet)		(Thousand board feet)
Volume, 1963	2,518,000	4,043,000	1,993,500
Annual growth, 1962	87,714	134,925	75,300
Annual cut, 1962	29,800	50,700	16,800

1/ Subregion 6 also includes small portions of Missouri, Kansas, & Minnesota

Source: Missouri River Basin Study and the Mississippi River Basin Study to be published by the U. S. Corps of Engineers, Data prepared by North Central Forest Experiment Station

The volume of growing stock and sawtimber within the state of Iowa is steadily increasing at the rate of approximately 2.5% each year. Additional markets would allow the timberland owner of manager to favor choice species and better growing trees and remove the financially mature and undesirable trees thereby substantially reducing the annual mortality losses which are presently occurring.

Logging practices have consisted of cutting the more desirable trees and leaving stands of timber which are characterized by a large percentage of volume in the Number 3 log grade. Forest surveys indicate that less than one-third of the timber may be classified as containing Number 1 and Number 2 log grades and the remainder of the stand contains Number 3 grade logs. An unusually large quantity of material in the form of logging residues is being left in the woods.

Regionwide the timber inventories for selected subregions of the Upper Mississippi and Missouri River Basins which include the state of Iowa, provide records which compare favorably with the annual growth and cut for the state.

The enclosed chart indicates that the annual growth exceed the annual cut in 1962 by about three times for the subregions of Des Moines-Fort Dodge and Davenport-Rock Island-Moline in the Mississippi River Basin. In the Missouri River Basin, the annual growth in West Iowa, Eastern Nebraska, and small portions of adjoining states is nearly five times the annual cut.

Predictions on the growth of timber stands and the gross volume within the state will fall far short of the annual yield if the timber management program is intensified by the farmers and private landowners. Signs of progress are being made throughout the United States in many sections by increasing the use of plant and logging residues and salvable trees. Continued annual income from forest products may be further enhanced by the protection of the young stems immediately following logging operations.

The study of Iowa's forestland indicates that a large percent of the commercial forest areas are understocked at the present time. The annual return from a well stocked stand as compared to a partially stocked stand is as follows:

Example 1/

	Volume per acre (board feet)	Growth (6%)	Return @ %30.00 (per thousand bd.ft.)
Well stocked	5000	300	$9.00
Partially stocked	2200	132	3.96

1/ This is assuming that the site will support 5,000 board feet of timber per acre and retain the growth rate. Stocking on less productive sites will not support this volume per acre.

The loss due to mortality within stands can be cut down considerably in well managed stands. Salvage of the dead trees plus harvesting of the financially mature trees reduces mortality.

Even sound cull trees seriously limit usable growth in many stands. Although these cull trees are defined as unmerchantable for sawlogs, in some areas they are being increasingly cut for pulpwood, stave bolts, and dimension stock. Cull trees take up much space that might be otherwise productive of desirable stock.

> The steadily increasing trend was accurately predicted in The Forest Resources of Iowa in accordance with the following table which is a projection of volumes for the years 1965 and 1975. The 1953 forest inventory for the state of Iowa showed that the net board foot increase after deducting the quantity of timber harvested and loss through annual mortality, as follows:

Potential timber volumes and annual net growth in 1965 and 1975. Under certain assumptions as to future timber requirements and progress in forestry 1/

	Timber Volume			Annual Net Growth		
	1954	1965	1975	1954	1965	1975
All growing stock: (Millions of Cubic Feet)	1382	1837	2233	68	71	75
Sawtimber only: (Millions of Board Feet)	5092	6407	7677	224	247	266

1/ The outlook for timber volumes and net annual growth in 1965 and 1975 is based on assumptions that the annual timber products output in the United States and Iowa will rise with estimated increases in population, national income, and the position of wood in the national economy. Also, that forestry will continue to progress at the rate indicated by recent trends including advances in protection, management, and reforestation. These projections were developed from trends for the entire Central States as prepared for the upper level of future timber requirements shown in the preliminary review draft of the Timber Resource Review. These trends are predicted upon anticipated future timber product demands on the Central States forests, a continuing pattern of reforestation, a "thickening up" of natural stands, and other changes leading to a more productive forest resource.

Source: U. S. Department of Agriculture Forest Service, Forest Survey Release #22, The Forest Resources of Iowa, 1959.

Economic Subregions of Iowa

A comparison of the area in Iowa by stand size for the years 1954 and 1963 shows no appreciable change in the area of commercial forest land by the stands. 1/ and 2/

It is assumed here that the commercial forest area by stand size and geographic regions is reasonably correct as of 1968.

Year	Total	Sawtimber Stands	Poletimber Stands	Seedling & Sapling Stands	Nonstocked Areas
			(Thousand Acres)		
1968	2595	1006	830	287	472

The volume of woods residue as presented in the initial survey of 1952 could provide raw material within the state to support plants using a total of 360,000 cords per year for a period of over twenty years. These figures do not include the woods residue which is available from adjoining states or plant residue which is rapidly gaining favor. 1/

Northeastern Survey Region

The total land area of Northeastern Iowa is recorded as 7,634,000 acres, and 11% of this area is classified as forest acreage. Allamakee County has 132,000 acres in forest land and Clayton County has 120,000 acres classified as forest land. All but 6,000 acres of the 852,000 acres of forest land is classified as productive and the balance of the acreage, 846,000 acres, is classified as commercial forest area. Forest land in the amount of 829,000 acres is owned by farmers, industry and other private owners.

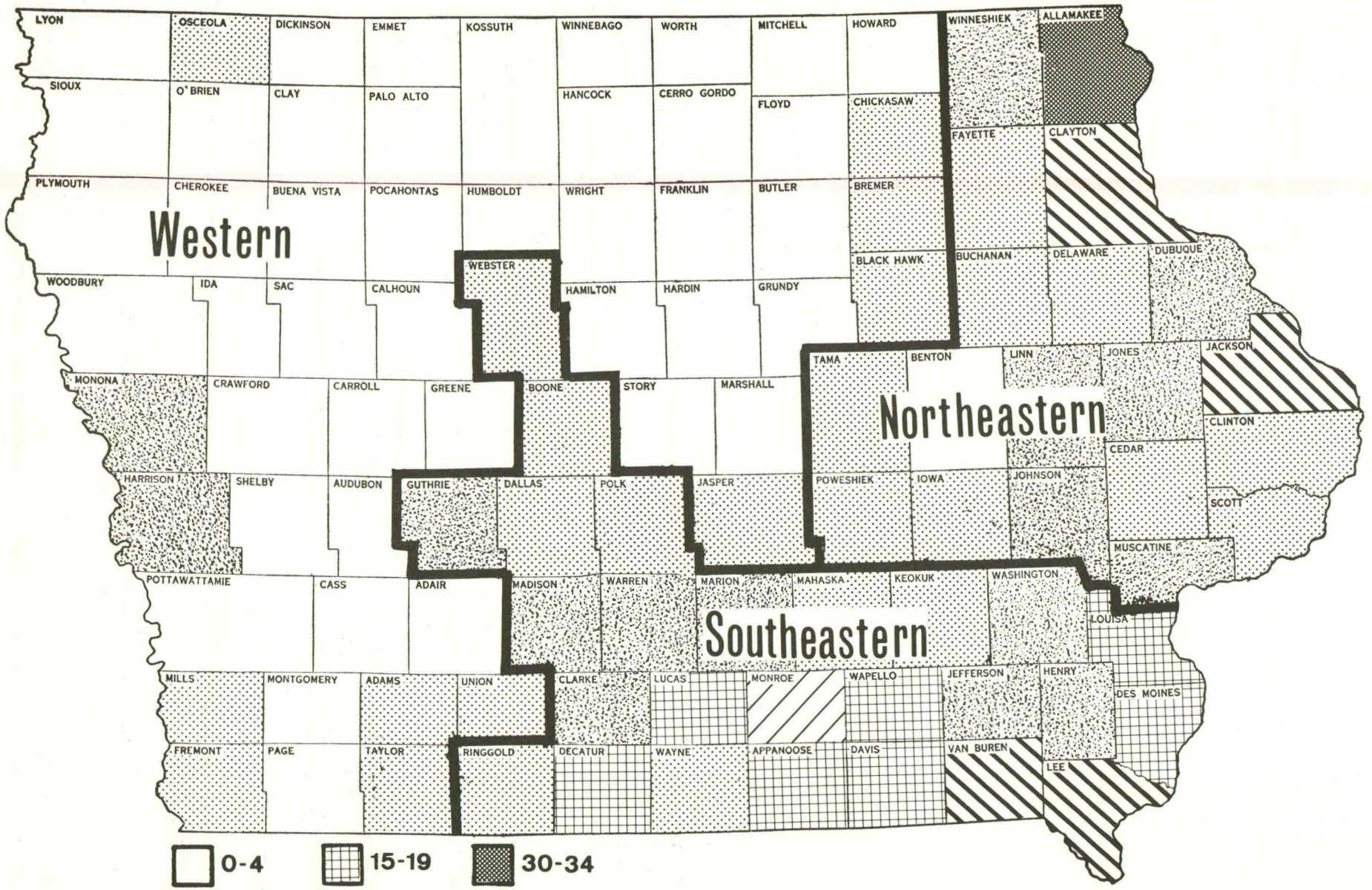
Northeastern Iowa - 1968
(Commercial forest area of 846,000 acres, more or less)

	GROWING STOCK (cubic feet)	SAWTIMBER only (board feet)
Northeastern Survey Region	737,000,000	2,915,000,000

1/ U. S. Department of Agriculture, Forest Service, Forest Survey Release Number 22, The Forest Resources of Iowa, 1959

2/ U. S. Department of Agriculture, Forest Service, Forest Report Number 17, Timber Trends in the United States, 1965.

FOREST SURVEY REGIONS AND PERCENTAGE OF FOREST LAND BY COUNTIES



*Original Survey, U. S. Department of Agriculture, Forest Service Survey Release Number 22 **The Forest Resources of Iowa,** 1959.

The net annual growth in 1968 at the rate of .025 provides the following estimated increment over and above drain consisting of reduction through harvesting and mortality losses.

Northeastern Iowa - 1968

	GROWING STOCK (cubic feet)	SAWTIMBER only (board feet)
Net annual growth in 1968	18,442,500	72,875,000

The cubic foot increase reflects annual growth only on the trees which have been classified as growing stock. Some 233,000 cords of wood are annually available to industry in this area and to his cordwood figure may be added residual volumes which may be found in the woods and local plants.

Under present operating conditions it is believed that the percentage of annual net growth will increase. The number of small industrial plants, which operated on a part time basis, is on a decline and some of the larger sawmills have closed down or are producing a minimum quantity of lumber.

It is estimated that there is more than 150,000,000 board feet of timber contained in sound cull trees measuring less than 8 feet in length in this survey region.

Suggested plant sites which provide all of the factors needed for the establishment of each of several hardwood plants include Lansing (Allamakee County), Dubuque, Davenport and Muscatine.

Total Land and Forest Area in Northeastern Iowa

County	Total land area	Forest area	
	Thousand acres	Thousand acres	Percent
Allamakee	409	132	32
Benton	460	20	4
Buchanan	364	17	5
Cedar	374	23	6
Clayton	498	120	24
Clinton	445	30	7
Delaware	367	27	7
Dubuque	389	56	14
Fayette	466	38	8
Iowa	374	30	8
Jackson	412	82	20
Johnson	397	41	10
Jones	374	42	11
Linn	456	46	10
Muscatine	281	30	11
Poweshiek	377	17	5
Scott	290	15	5
Tama	461	30	7
Winneshiek	440	56	13
Total	7,634	852	11

Commercial Forest Area by Ownership in Northeastern Iowa

Ownership Class	Northeastern
	Thousand acres
Federal:	
National forest	-
Indian	1.0
Other	7.6
Total	8.6
State	7.2
County and Municipal	.6
Private:	
Farm	764.0
Industrial and other	65.6
Total	829.6
All ownerships	846.0

Commercial Forest Area in Northeastern Iowa by Forest Type

Forest Type	Acres	Total	Percentage	Total
	Thousand acres			
Oak-Hickory	364		43.0	
Elm-Ash-Cottonwood	346		40.9	
		710		83.9
Northern Hardwoods	66		7.8	
Aspen-Birch	15		1.8	
Bur-Oak	36		4.3	
Hardwood-Red Cedar	19		2.2	
		136		16.1
Total		846		100.0

Commercial Forest Acreage in Northeastern Iowa by Stand-Size

Stand-Size Class	Area	Total	Percentage	Total
	Thousand acres	Thousand acres		
Large Sawtimber Stands	309		36.5	
Small Sawtimber Stands	133		15.7	
		442		52.2
Pole Timber Stands	248		29.3	
Seedlings & Sapling Stands	44		5.2	
		292		34.5
Non-Stocked areas	112		13.3	
		112		13.3
Total		846		100.0

Southeastern Survey Region

The forest area of Southeastern Iowa is 1,138,000 acres and amounts to 13% of the total land area of 8,682,000 acres. Eleven thousand acres have been withdrawn from timber use leaving 1,127,000 acres classified as productive commercial forest land. State, industry, and others own 161,900 acres and farmers or private landowners own 965,000 acres.

Southeastern Iowa - 1968
(Commercial forest area of 1,127,000 acres, more or less)

	GROWING STOCK (cubic feet)	SAWTIMBER only (board feet)
Southeastern Survey Region	619,200,000	2,213,000,000

The net annual growth in 1968 at the rate of .025 provides the following estimated increment over and above drain consisting of reduction through harvesting and mortality losses.

Southeastern Iowa - 1968

	GROWING STOCK (cubic feet)	SAWTIMBER only (board feet)
Net annual growth in 1968	15,480,000	55,325,000

The cubic foot increase reflects annual growth only on the trees which have been classified as growing stock. Cords of wood annually available to industry in this area amounted to 196,000 cords and to this figure may be added the cubic volumes of wood classified as other than growing stock.

It is estimated that there is an additional 250,000,000 board feet or more of timber contained in sound cull trees measuring less than 8' in length in this survey region.

The Des Moines River provides a supply of water in addition to that which may be supplied by well water or frontage on the Mississippi River. Industrial sites in the southeast may include Keokuk on the Mississippi and Des Moines River and the interior city of Ottumwa located on the Des Moines River.

SOUTHEASTERN SURVEY UNIT

County	Total land area 1/	Forest area	
	Thousand acres	Thousand acres	Percent
Appanoose	335	56	17
Boone	367	30	8
Clarke	275	39	14
Dallas	382	36	9
Davis	326	51	16
Decatur	339	57	17
Des Moines	262	40	15
Guthrie	381	38	10
Henry	282	36	13
Jefferson	279	37	13
Keokuk	371	35	9
Lee	334	81	24
Louisa	258	41	16
Lucas	278	51	18
Madison	362	50	14
Mahaska	366	31	8
Marion	363	52	14
Monroe	278	71	26
Polk	380	32	8
Ringgold	344	27	8
Van Buren	312	64	21
Wapello	280	49	18
Warren	366	44	12
Washington	363	37	10
Wayne	340	27	8
Webster	459	26	6
Total	8,682	1,138	13

1/ Source: Areas of the United States, 1950, U. S. Bureau of the Census. Does not include areas listed as inland water.

Commercial forest area by ownership in Southeastern Iowa

Ownership Class	Southeastern
	Thousand acres
Federal:	
National Forest	2.7
Indian	-
Other	1.6
Total	4.3
State	12.8
County and municipal	.5
Private:	
Farm	965.1
Industrial and other	144.3
Total	1,109.4
All ownerships	1,127.0

Commercial Forest Area in Southeastern Iowa by Forest Type

Forest Type	Thousand Acres	Percent
Oak-Hickory	567	50.3
Elm-Ash-Cottonwood	503	44.6
Total	1,070	94.9
Northern Hardwoods	5	.5
Aspen-Birch	-	-
Bur-Oak	37	3.3
Hardwood-Red Cedar	15	1.3
Total	57	5.1
Grand Total	1,127	100.0

Commercial forest acreage in Southeastern Iowa by Stand-Size

Stand-Size Class	Thousand Acres	Percent
Large sawtimber stands	224	19.9
Small sawtimber stands	99	8.8
Poletimber stands	396	25.1
Seedling and sapling stands	192	17.0
Nonstocked and other areas	216	19.2
Total	1,127	100.0

Western Survey Region

The Forest Survey took in much of the Northern one-half of Iowa as part of the sub-region designated as Western Iowa with the result that of 19,553,000 acres only 630,000 acres, or 3% of the total land area, was classified as forest acreage. Private ownership totaled 619,200 acres of which farm ownership was listed as 553,000 acres. Commercial forest acreage amounted to 622,000 acres.

Western Iowa - 1968
(Commercial forest area of 622,000 acres, more or less)

	GROWING STOCK (cubic feet)	SAWTIMBER only (board feet)
Western Survey Region	451,500,000	1,809,000,000

The net annual growth in 1968 at the rate of .025 provides the following estimated increment over and above drain consisting of reduction through harvesting and mortality losses.

Western Iowa - 1968

	GROWING STOCK (cubic feet)	SAWTIMBER only (board feet)
Net annual growth in 1968	11,287,500	45,225,000

There is an estimated 142,800 cords of growing stock annually available to industry in this area and an additional cordage available to industry from other material which includes more than 125,000,000' of short butt logs.

The cities of Sioux City and Council Bluffs are well located on the Missouri River frontage and can use water facilities not only for manufacturing purposes but also for the transportation of raw material to plant sites and finished products to the market.

The availability of soft hardwood material from the Platte River area and softwood from South Dakota and Western Nebraska would make these potential sites worth consideration by a woods product industry who desires to process softwood and hardwood in combination.

Western Survey Unit

County	Total land area	Forest Area	
	Thousand acres	Thousand acres	Percent
Adair	364	12	3
Adams	273	16	6
Audubon	287	4	1
Black Hawk	363	17	5
Bremer	281	15	5
Buena Vista	367	5	1
Butler	373	15	4
Calhoun	366	2	1
Carroll	367	5	1
Cass	358	9	3
Cerro Gordo	369	4	1
Cherokee	367	11	3
Chickasaw	323	16	5
Clay	365	8	2
Crawford	458	14	3
Dickinson	244	4	2
Emmet	253	4	2
Floyd	322	9	3
Franklin	375	4	1
Fremont	335	31	9
Greene	364	12	3
Grundy	321	1	1/
Hamilton	369	9	2
Hancock	365	3	1
Hardin	367	14	4
Harrison	445	44	10
Howard	301	11	4
Humboldt	278	6	2
Ida	276	2	1
Jasper	471	31	7
Kossuth	627	8	1
Lyon	376	4	1
Marshall	367	14	4
Mills	285	25	9
Mitchell	299	10	3
Monona	446	48	11
Montgomery	270	10	4
O'Brien	368	4	1
Osceola	255	2	8
Page	342	12	4

continued from preceding page

County	Total land area 1/	Forest Area	
	Thousand acres	Thousand acres	Percent
Palo Alto	359	6	2
Plymouth	552	12	2
Pocahontas	371	1	1/
Pottawattamie	617	27	4
Sac	370	6	2
Shelby	376	5	1
Sioux	490	3	1
Story	364	13	4
Taylor	338	21	6
Union	273	22	8
Winnebago	257	3	1
Woodbury	558	25	4
Worth	257	5	2
Wright	369	6	2
Total	19,553	630	3

2/ Less than 0.5 percent.

Commercial forest area by ownership in Western Iowa

Ownership Class	Western
	Thousand acres
Federal:	
National Forest	-
Indian	-
Other	-
Total	-
State	2.0
County and municipal	.8
Private:	
Farm	553.0
Industrial and other	66.2
Total	619.2
All ownerships	622.0

Commercial Forest Area in Western Iowa by Forest Type

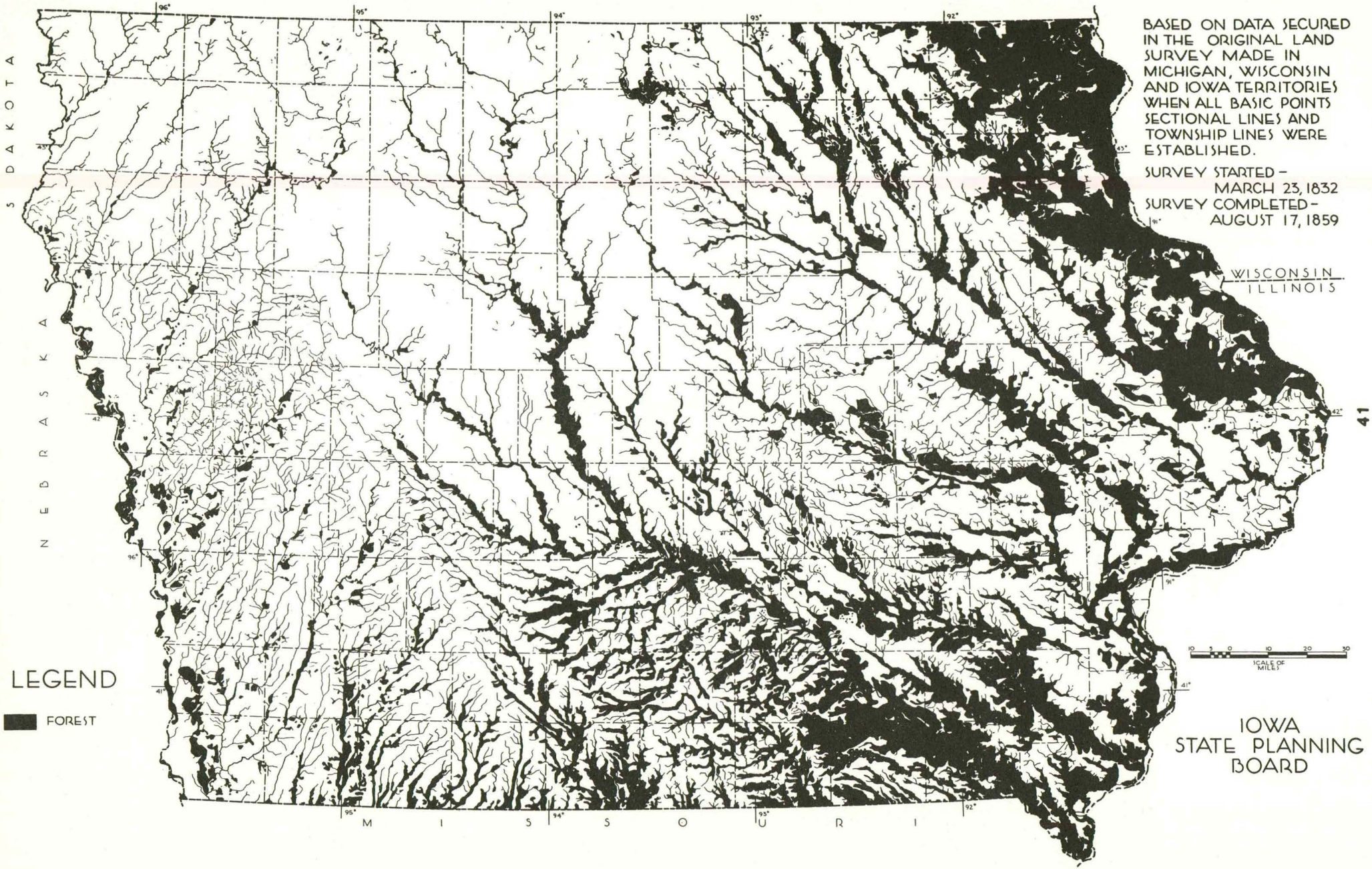
Forest Type	Thousand Acres	Percent
Oak-Hickory	105	16.9
Elm-Ash-Cottonwood	370	59.5
Total	475	76.4
Northern Hardwoods	7	1.1
Aspen-Birch	5	.8
Bur-Oak	129	20.7
Hardwood-Red Cedar	6	1.0
Total	147	23.6
Grand Total	622	100.0

Commercial forest acreage in Western Iowa by Stand-Size

Stand-Size Class	Thousand Acres	Percent
Large sawtimber stands	205	33.0
Small sawtimber stands	36	5.8
Poletimber stands	186	29.9
Seedling and sapling stands	51	8.2
Nonstocked and other areas	144	23.1
Total	622	100.0

IOWA STATE PLAN

ORIGINAL FOREST COVER



BASED ON DATA SECURED IN THE ORIGINAL LAND SURVEY MADE IN MICHIGAN, WISCONSIN AND IOWA TERRITORIES WHEN ALL BASIC POINTS SECTIONAL LINES AND TOWNSHIP LINES WERE ESTABLISHED.

SURVEY STARTED – MARCH 23, 1832

SURVEY COMPLETED – AUGUST 17, 1859

LEGEND

FOREST

IOWA STATE PLANNING BOARD

Adjoining the Missouri River on the west the heaviest concentrations of hardwood timber lie in the counties fronting the river. A volume of more than 100,000,000 board feet of timber is to be found in an area located within fifty miles of Sioux City, Iowa.

Other Factors Contributing to the Forest Resources of Iowa

Efforts to educate and encourage the forest landowners are slowly progressing as shown by the progress chart of Iowa Tree Farm Status published by the American Forest Products Industries Incorporated. The tree farm program is under the direction of the State Conservation Commission and was initiated in 1955, at which time six tree farms were established containing an area of 449 acres. Present figures as of January 1, 1968 indicate that there are now 180 tree farms throughout the state of Iowa involving 12,251 acres.

Progress Chart - Iowa Tree Farm Status 1/

Year	Tree Farms	Acreage
1955	6	449
1956	29	1,966
1957	54	3,556
1958	72	4,515
1959	88	6,188
1960	109	7,767
1961	125	8,719
1962	135	9,041
1963	141	10,002
1964	154	10,498
1965	161	10,671
1966	176	11,475
1967	180	12,251

The tree farming and planting acreages may be greatly extended in consideration of the fact that Iowa's original forest cover, surveyed as nearly 7,000,000 acres, has been gradually reduced to a commercial forest acreage of 2,600,000 acres.

Iowa State University Facilities

The state of Iowa has the advantage of providing a School of Forestry within the Agricultural College of Iowa State University at Ames, Iowa. The Department of Forestry has just moved to new facilities known as Bessey Hall and an elaborate

1/ American Forest Products Industries, Inc., Washington, D. C., Memorandum, Tree Farm Progress Report, December 31, 1967.

research laboratory in cooperation with the North Central Forest Experiment Station has been constructed.

Improved research facilities in Bessey Hall support recently expanded research and graduate programs in forest economics, forest management, forest mensuration, silviculture, and wood science and technology. The well equipped teaching laboratories and classrooms stimulate both resident teaching and continuing education programs.

In 1904 the professional curriculum in forestry was organized at Iowa State College. Since that date the undergraduate forestry program has continued without interruption and forestry graduates are distributed throughout the state of Iowa, adjoining states, and over the entire United States.

The research facilities will prove to be of advantage to state forestry personnel, who in turn will give landowners benefit of their recommendations.

Tree Farm Program

The Tree Farm Program has been encouraged in the state of Iowa by providing forest reservations to be assessed on a taxable valuation of $4.00 per acre. Other provisions include the restraint of grazing by livestock and this provision was designed to eliminate and control the cause of the most accessive damage to trees and seedlings in the state of Iowa.

One of the most interesting facts of the tree farming program involves the forming of an Industrial Tree Farm Family sponsored by a paper mill. Industrial foresters work in close cooperation with District Foresters providing technical assistance to members of the Tree Farm Family, and a bonus is paid participants for wood harvested from their lands.

The number of forest management plans and calls upon the State Conservation Commission for assistance with woodlot problems are heavily concentrated near each District Forester's headquarters. The county in which the District Forester resides and the counties immediately joining his headquarters provide the majority of calls made within each district.

Requests for advice include need of assistance for the management plans and the marketing of wood products, the planting of trees, timberstand improvement measures site preparation for natural or artificial regeneration, disease control, wild-life habitat suggestions, and general information on the growing of trees in woodlots or shelterbelts.

The management plans being prepared by the state forestry personnel clearly indicate the full possibility of securing satisfactory income from tracts of forest land which have reasonable care. It is recognized that these records may have been made on tracts of land which are above average since the individuals who call for

assistance may have kept fire from their woodland acreage and controlled grazing by restraining their hogs and cattle to the confines of feedlots.

State forestry personnel can assist the landowner in the marketing of wood products by making an accurate appraisal of the volume of timber concerned in each transaction. Supervision may also be provided so that care will be taken of the growing stock or potential crop trees to provide for the successive cutting of good grade of material as the timber cutting cycle progresses.

Progress has been made in reducing the annual losses from forest fires but great damage is caused by livestock grazing in the woods. The number of stems per acre of all species on ungrazed Iowa woodlots is entirely satisfactory but individual tracts of land vary greatly as to the value of the products which can be harvested. In many cases, the forest lands have been mistreated through the cutting of only choice trees or trees of the most desirable species and the large residual trees remaining on the land can only be graded as tie or pulpwood material. These remaining trees are suppressing the potential growing stock in crop trees, and should be removed on the very first opportunity to permit the rapid development of the young timber. Although there is good market of veneer logs of several species, the production of chips, shavings and other low grade products will not provide the landowner with income which will compare favorably with the income which he received from the lands on which he grows crops.

The planting of trees for windbreaks, shelterbelts, and shade has been well accepted for many years and this program has expanded into planting for forest production as the state-owned forest nursery has increased its seedling production.

The most success in the planting of hardwoods to date has been in the inter-planting of native species on forest sites. Problems have been encountered in the planting of old fields as stagnant growth has been the result of reforestation attempts. Iowa has had the best success in planting conifers through the use of White Pine and Red Pine species. These two species of Pine have been grown successfully and appear to reproduce themselves. Some blister rust has developed in White Pine plantings north of Highway 30 but has not been a serious problem. The micro-climate conditions south of Highway 30 prevents any problem with the disease in this area.

The state of Iowa distributes several species including Red and White Pine, Scotch Pine and Austrian Pine. The Austrial Pine has been unsuccessful because of the needle blight and the European sawfly. White and Norway Spruce appear to do well in the state but the initial growth is slow.

Seedling trees and shrubs available for distribution during spring of 1968 include:

Austrian Pine	White Pine	Black Walnut (Seedlings)*
European Larch	Norway Spruce	Multiflora Rose
Jack Pine	Green Ash	Dogwood
Ponderosa Pine	Red Oak	Honeysuckle
Red Pine	White Oak	Ninebark

* Maximum order for black walnut seedlings will be 1500 per landowner. A special minimum of 50 has been set for this species with multiples of 50 thereafter until the maximum is reached in order to supply as many landowners as possible.

Other hardwood species which may be available include Soft Maple, Cottonwood, Sycamore and Bur Oak.

The growth on White and Red Pine trees has proven to be entirely acceptable particularly on plantations which were cared for chemically and followed up later with an early pruning program. Weed and grass competition and shrub encroachment are problems on soils of average fertility.

The program of planting the choice Walnut trees which are so valuable as to receive special consideration on an individual tree basis can be promoted throughout the state provided correct and accurate information is made available to the landowners so these trees may be grown to financial maturity. In addition to the selection of suitable sites for walnut, provision must be made for the control of rodents and deer damage, and weed control conforming to the state laws. Selected or superior trees may possibly be produced which would reduce the damage effected by the late spring frost after budding.

It is suggested that the species of trees which are selected for planting as windbreaks be trees which will produce a desirable crop tree which may eventually be marketed to provide income to the landowner. It is recognized that individual Walnut trees may be successfully harvested, but normally forest products are handled in large volumes which require the production of material by the number of loads or cords per acre. The production of five to fifteen cords per acre can be realized from reasonably fully stocked stands and leave little evidence that a logging operation has just taken place provided low stumps are cut and the topwood is utilized to the fullest.

The cost and returns from a hypothetical Pine plantation of Red or White Pine based on a 73 rotation and multiple product utilization for one acre presented by Mr. Newton J. Hansen - 1961 indicated the following results:

Average annual net return without ACP	$11.46
Average annual net return with ACP help	35.44

Information reported by Mr. Hansen indicated that Red Pine plantations were established on the Shimek State Forest in 1939 and 1940. The plots have been thinned three times and the merchantable yield per acre at twenty years, if clear cut for pulpwood, is estimated to yield 52 tons. The value as pulpwood delivered to the mill at $6.00 per ton provides for a total yield of $312.00 per acre.

Christmas Trees

Iowa lands which are of relatively steep slope, cut up terrain, or composed of the poor soils not suitable for pasture or agriculture purposes are satisfactory for the establishment of Christmas tree plantations. Care should be taken to plant species of trees which will develop into choice Christmas tree material.

Christmas tree production has a definite impact upon the forest economy of the state of Iowa. On certain soil types of sandy lands, pine trees can grow more rapidly than hardwood species. Plantations of pine trees on these lands may be planted at close spacing so that early thinnings may be made by harvesting Christmas trees.

There is no market for a poor quality tree and it is essential that a high quality and sheared Christmas tree be produced. The production of Christmas trees is a business like venture and is a tree farming project requiring hard work in addition to the original establishment of the plantations. The work of a Christmas tree grower includes the shearing and shaping of individual trees, fertilizing, mowing, and spraying some species with water soluble dye.

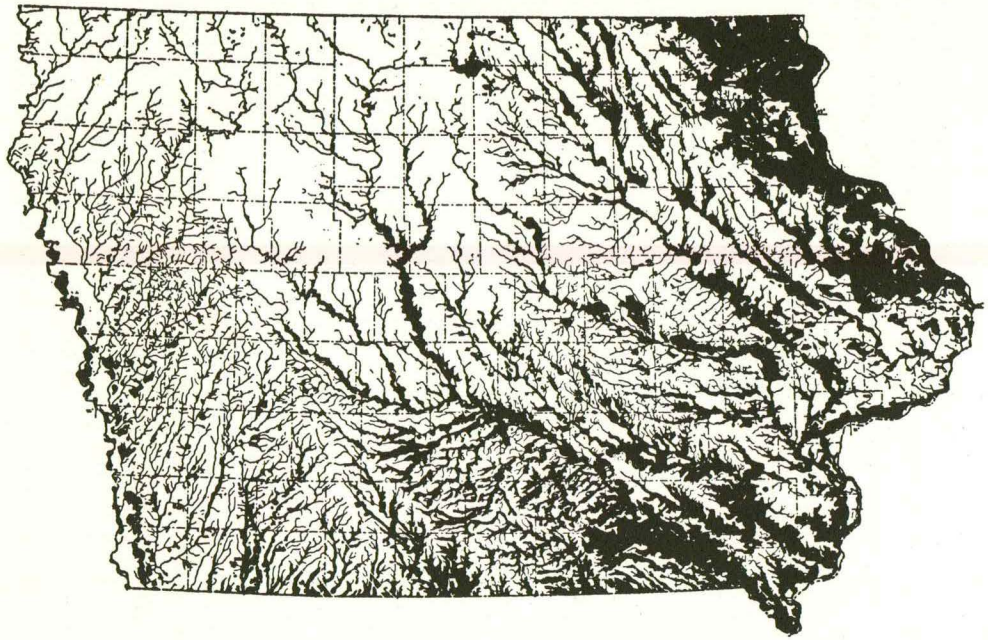
Christmas trees may be cultivated by farmers during off season moments and marketed during the early weeks of December so as not to interfere with other farming activities. Modern farming equipment has provided farm operators with additional time on their hands which permits the utilization of the poorer lands which had been unproductive. There is a gradual transition to younger farm operators who are capable of caring for larger tracts of land. The average age of Iowa farmers today is fifty-seven years of age and these farmers are to eventually retire and turn over their farms to the younger members of their families who should prove to be greatly more interested in activities other than strictly agricultural farming or livestock management.

Iowa Soils

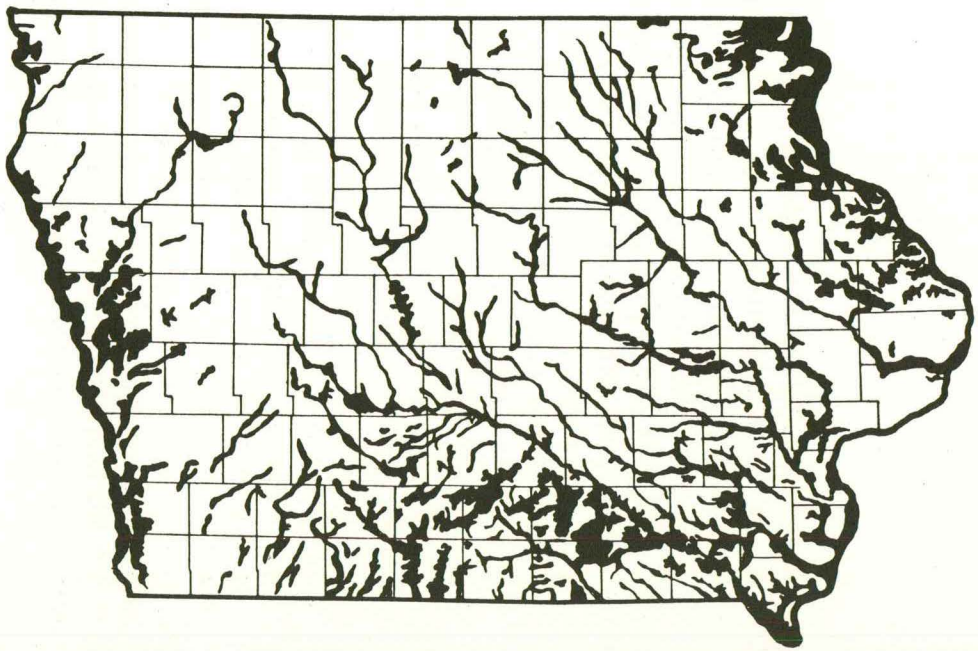
The original forest cover for the state of Iowa was estimated to be nearly seven million acres. At the present time the lands on which forest products are normally found consist generally of rougher terrain where the steepness of slope, soil erosion, and qualities of soil do not permit the clearing of these acres for pasture or cropland.

The assignment of a value or price per acre on these lands is therefore less than the value placed on the rich cropland tracts. Further consideration has been given forest lands in that landowners may secure substantial tax reductions on lands which have been declared a forest or fruit tree reservation. This reduction of taxes on forest lands provide the landowner with the assurance that his agriculture lands are not paying for the tax assessed on the tree farming or woodland areas so that wood products harvested from the woodland areas which are conscientiously cared for will provide an entirely satisfactory income.

FOREST COVER MAPS



The map on the left indicates Iowa's original forest cover. Early land survey set the forest land area at almost 7 million acres. Woodlands were protected from prairie fires by the first residents and little timber harvesting was done. Later, as farmland values increased, forest exploitation began and forest acreages were rapidly reduced.



The map on the right shows the present forest area in Iowa which totals about 2.6 million acres. This area remains stable as land clearing is balanced by increasing acreage in southeastern and south central Iowa where new markets have made good woodland management economically attractive. Today, there are over 600 wood using industries in the state.

The stands of timber do not necessarily reflect the quality of the site upon which they occur. In Iowa, the short bodied trees may not be true site indicators as these trees may be residual trees left by former logging operations and are limby as a result of being open grown. Intermediate stems produce better grade and longer logs and on the good forest land areas will produce an average of three to three and one-half 16-foot logs in mature, dominant hardwood trees.

Indication of site quality varies by geographic area and generally, forest land sites in northeast Iowa are the best and in southeast Iowa are the poorest.

The state of Iowa is included in the Midland feed region which extends from central Ohio to western Nebraska and from southwestern Missouri to central Minnesota. This region has 11.5% of the total land area of the United States and more than 34% of the total cropland. The soils in this productive region are generally medium to fine texture and have good structure. These soils hold moisture well and were formed chiefly from glacial and related soil material. Four of the five subregions have been recognized in Iowa as being in the Midland feed region and they are as follows:

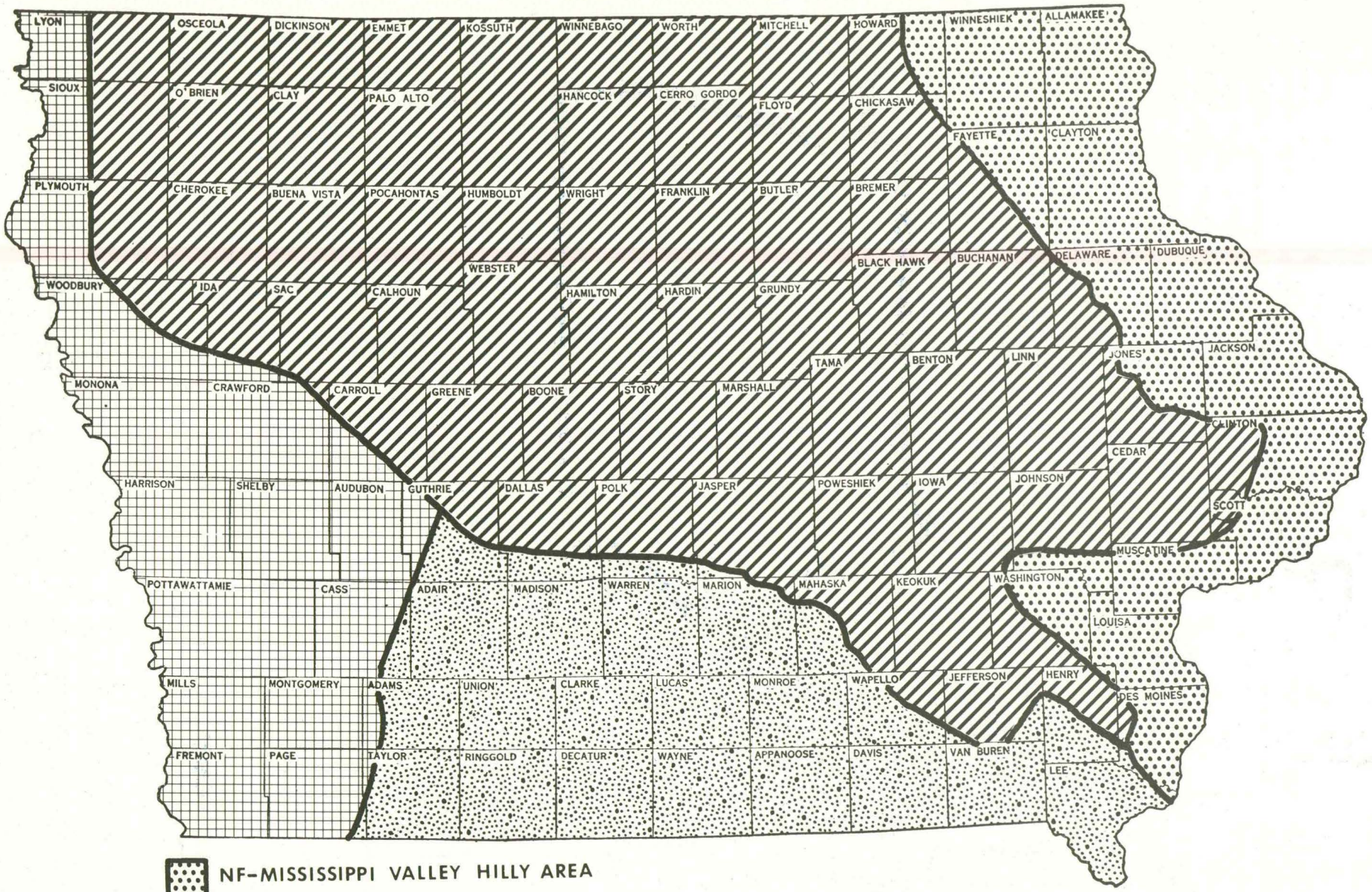
P - Central Prairie Subregion
NF4 - Northern Forest Subregion (Miss. Valley Hilly Area)
SP-F - Southern Prairie Forest Subregion
WP-1 - Western Prairie Belt Subregion (Missouri Valley Hilly Area)

The four subregions listed above extend into Iowa. The soils of the prairie subregions contain more loess and organic matter and are darker in color than the soils of the forest subregions.

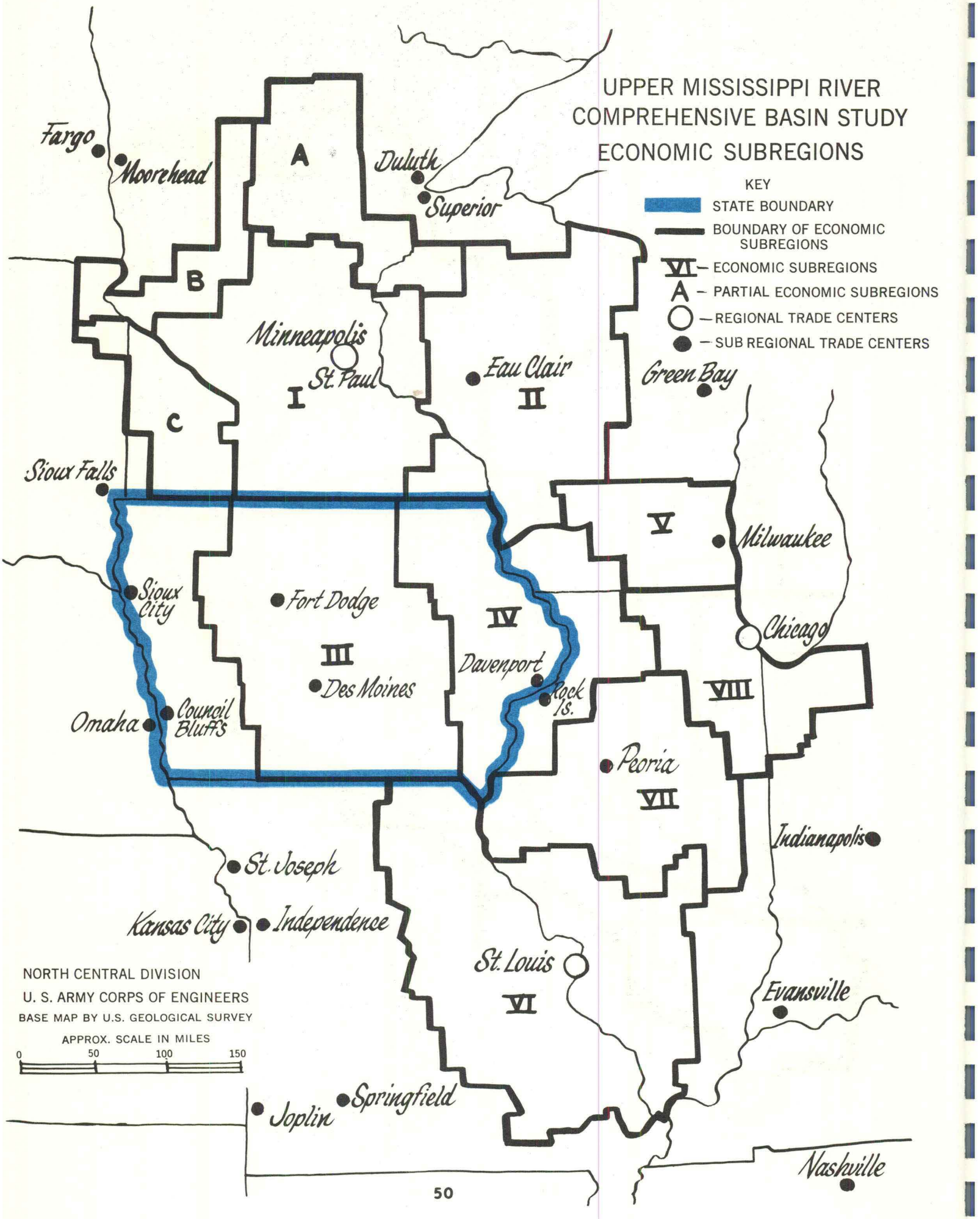
More than one-half of the state of Iowa is included in the Central Prairie Subregion. This subregion consists of a nearly continuous area of level to gently rolling topography. The Muscatine silt loam soil in eastern Iowa where the loess blankets the glacial till, is considered by some agronomists to be the best soil type in the region. The soil has a thick dark surface layer, occurs on nearly level slopes, and seldom requires artificial drainage. The Webster and Clyde soils of Iowa are typical examples of naturally poorly drained soils that have been extensively drained with tile. This subregion is the heart of the corn belt and the chief crops are corn and other cash crops.

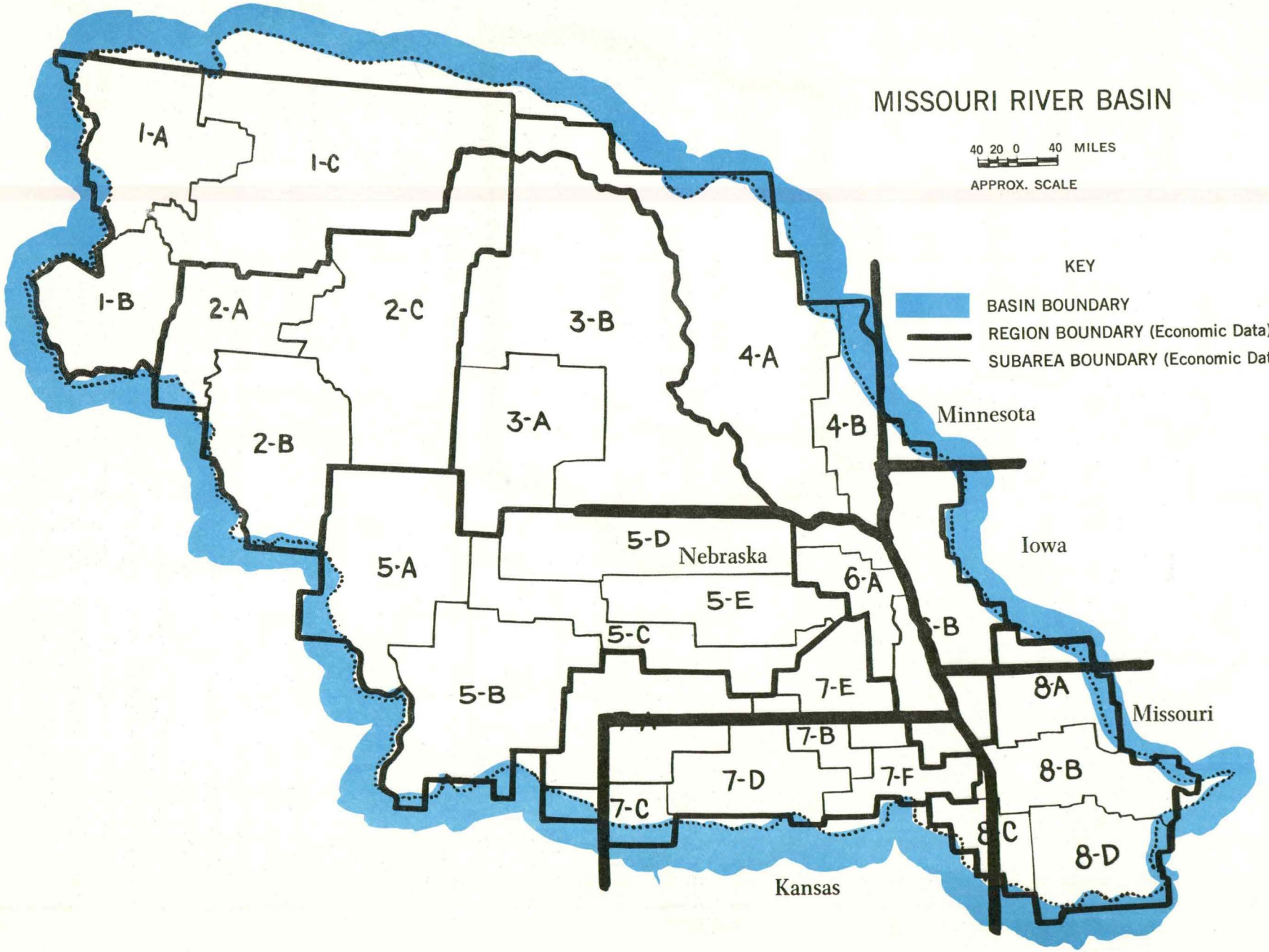
Most of the Northern Forest Subregion is cooler because of the climate and the growing season is shorter than in other parts of the Midland feed region. Most of the soils in the subregion are light in color and low in organic matter, except in areas of poor natural drainage because of being formed under forest vegetation.

The part of Iowa included in this subregion is subdivided further into the Mississippi Valley Hilly area. This area is rolling or quite steep. The soils are mostly friable silt loams derived from glacial materials, primarily silty loess. Soils in this area formed from limestone and sandstone, often are shallow, especially on the steeper slopes where rock outcroppings occur. In this area where sheet and gully erosion is moderate to serious, special practices to control erosion are necessary. Strip



Major timber types are typical of the four subregions which extend into Iowa.


UPPER MISSISSIPPI RIVER
COMPREHENSIVE BASIN STUDY
ECONOMIC SUBREGIONS
KEY
STATE BOUNDARY
BOUNDARY OF ECONOMIC SUBREGIONS
VI — ECONOMIC SUBREGIONS
A — PARTIAL ECONOMIC SUBREGIONS
— REGIONAL TRADE CENTERS
— SUB REGIONAL TRADE CENTERS
Fargo
Moorehead
Duluth
Superior
Minneapolis
St. Paul
Eau Clair
Green Bay
Sioux Falls
Milwaukee
Sioux City
Fort Dodge
Chicago
Davenport
Des Moines
Rock Is.
Omaha
Council Bluffs
Peoria
Indianapolis
St. Joseph
Kansas City
Independence
St. Louis
Evansville
Joplin
Springfield
Nashville
A
B
C
I
II
III
IV
V
VI
VII
VIII
NORTH CENTRAL DIVISION
U. S. ARMY CORPS OF ENGINEERS
BASE MAP BY U.S. GEOLOGICAL SURVEY
APPROX. SCALE IN MILES
0
50
100
150


MISSOURI RIVER BASIN
40 20 0 40 MILES
APPROX. SCALE
KEY
BASIN BOUNDARY
REGION BOUNDARY (Economic Data)
SUBAREA BOUNDARY (Economic Data)
1-A
1-C
1-B
2-A
2-C
3-B
4-A
2-B
3-A
4-B
Minnesota
5-D
Nebraska
Iowa
5-A
6-A
5-E
5-C
-B
5-B
7-E
8-A
Missouri
7-B
8-B
7-D
7-F
7-C
8-C
8-D
Kansas

cropping on the contour is practiced more extensively here than in any other area in the region.

Many narrow to moderately broad tabular divides and strongly sloping flanks occur in the Southern Prairie Forest Subregion. Many of the steeper areas near the major streams were originally forested. Tall grass prairies covered the level and gently sloping areas, although trees also grew on many of the level places in the northeastern part. The soils and topography make this area less favorable for corn than the Central Prairie Subregion. The soils on the gently sloping to level tabular divides were formed from silty loess. They have medium textured surface layers. The more level areas of this subregion have unfavorable subsoils for water and root penetration and are excessively wet in many spring seasons. Drainage is needed, but tiling is generally not practical. The large amount of strongly sloping soils of relatively poor porosity is reflected in the acreages not in crops. In the rolling areas where Lindley soils are dominant, trees of low quality occur.

Because of the climate and topography of the Western Prairie Subregion moisture often limits crop yields. The main type of farming is general farming. Considerable emphasis is put on livestock, primarily beef cattle and hogs. The part of Iowa included in this subregion is subdivided further into the Missouri Valley Hilly Area. The elevation along the Missouri River is about 1,000' above sea level and the adjacent hills are 50' to 100' higher. In the many small drainage crops, deep wide gullies form and sheet erosion is a serious problem on the adjacent steep slopes. Conservation of soils and water remain one of the major problems.

The planting of the black walnut trees has been disappointing as the planted stems do not grow in diameter and height as the native stems have done. The new laboratory facilities at Ames are being used by research foresters in making an extensive study of the requirements of the walnut species and information obtained here should prove most helpful to foresters and landowners.

Information on site requirements for some of the species available for planting in Iowa is provided in the Chart Plant Guide - 1966.

Timber Resource Data of Iowa in the Upper Mississippi and Missouri River Basins

Recent comprehensive statistics are being compiled on the state of Iowa as the result of a study of forest resources being made of the Upper Mississippi and Missouri River Basins by the North Central Forest Experiment Station. The Des Moines-Fort Dodge Subregion falls entirely within the state and the Davenport-Rock Island-Moline Subregion includes eastern Iowa and small portions of Illinois and Wisconsin which lie immediately on the Mississippi River. Western Iowa is provided coverage in Subregion 6 of the Missouri River Basin study and records the greater volume of timber within the subregion although it includes eastern Nebraska and portions of Kansas, Missouri, and Minnesota.

PLANTING GUIDE - 1966
Site Requirements

Species Common Name	Soil Reaction: Acid	Neutral	Alkaline	Moisture: Droughty	Well Drained	Moist	Light: Full Sun	Some Shade	Fertility: Med. to High	Low
Silky dogwood	X	X	X		X	X	X	X	X	
Tartarian honeysuckle	X	X	X	X	X		X	X	X	X
Amur or maackii honeysuckle	X	X	X		X		X	X	X	X
Multiflora rose	X	X	X		X		X		X	
Ninebark	X	X	X		X	X	X		X	X
Wild Plum	X	X	X	X	X	X	X	X	X	X
Russian olive		X	X	X	X		X	X	X	X
Autumn olive (Cardinal strain)	X	X	X		X		X	X	X	
Nannyberry	X	X			X	X	X	X	X	
Silver maple		X			X		X		X	
Black walnut		X			X		X		X	
Purple willow (Tall form only)	X	X	X		X	X	X		X	X
PINES										
Austrian	X	X	X	X	X		X		X	X
Ponderosa	X	X	X	X	X		X		X	X
Red	X	X			X		X		X	X
Scotch	X	X		X	X		X		X	X
White	X	X			X		X	X	X	X
Jack	X	X		X	X		X		X	X
Red Cedar	X	X	X	X	X	X	X	X	X	X
SPRUCE										
Norway	X	X			X		X		X	
White	X	X			X	X	X	X	X	

Sources of information:

1. USDA Soil Conservation Service. Biology Handbook, 3rd. Ed. July 1950.
2. Wyman, Donald Shrubs and Vines for American Gardens. MacMillan 1958.
3. Trees for American Gardens. MacMillan 1959.
4. Tarr, Margherita and Rothacker. Landscape Plants for Iowa. Iowa State University March 1954.

Subregion	Identification Number	Area
MISSISSIPPI RIVER BASIN:		
Des Moines - Fort Dodge	III	Central Iowa
Davenport - Rock Island - Moline	IV	Iowa, Illinois & Wisconsin
MISSOURI RIVER BASIN:		
Subregion 6	6	Western Iowa & Eastern Nebraska*

* Includes small portions of Missouri, Kansas, and Minnesota

The central location of Iowa in the midwest region and within the Mississippi and Missouri River Basins encourages the importation of forest products from the adjoining states and states throughout the river basins.

The total timber resources of each of these subregions are readily available to Iowa industry. The commercial forest area is 3,914.1 thousand acres and the ownership is dominated by private owners. Farmers and private owners account for 3,857.3 thousand acres or 98.5% of the commercial forest area. The detailed survey statistics in each subregion are typical of the portion of Iowa included in the respective subregion.

Ownership of Commercial Forest Area

Subregion	Private Ownership	National Public Industry	Total
	(Thousand Acres)	(Thousand Acres)	(Thousand Acres)
MISSISSIPPI RIVER BASIN			
Davenport-Rock Island-Moline	1,621.3	34.6	1,655.9
Des Moines-Fort Dodge	1,222.0	17.2	1,239.2
MISSOURI RIVER BASIN			
Subregion 6	1,014.0	5.0	1,019.0
Total	3,857.3	56.8	3,914.1

The recent survey provides assurance of the estimated volume for 1968, and the species composition and other data provided in the charts reflect a true picture of 1968 patterns. Use of the original survey basic data and detailed information provided by the present survey has provided comparative figures for 1968 in the state of Iowa relative to the projection of the volume of timber present.

Estimate of the volumes of timber for the state of Iowa - 1968
(Commercial forest area of 2,600,000 acres, more or less)

Projections for 1968

	GROWING STOCK (cubic feet)	SAWTIMBER (board feet)
1954 Survey data - 1/	1,808,000,000	6,937,000,000
1963 Survey Data - 2/	1,831,800,000	7,016,700,000

Volume estimates for the portions of Iowa included in the three subregions are provided in the following chart.

STATE OF IOWA - 1963

	GROWING STOCK (Million Cubic Feet)	SAWTIMBER (Million Board Feet)
Davenport-Rock Island-Moline (East Iowa Counties)	734.2	2806.0
Des Moines-Fort Dodge (Central Iowa)	688.0	2518.0
Missouri River Basin (Subregion 6) (Estimate for West Iowa)	230.3	908.0
Total	1,652.5	6,232.0

Projection of volume to 1968, based upon the volume increase from 1954 to 1963 provides an estimate of the 1968 volumes for the state of Iowa.

1/ U. S. Department of Agriculture, Forest Service, Forest Survey Release Number 22, The Forest Resources of Iowa, 1959.

2/ Mississippi River Basin Study and the Missouri River Basin Study to be published by the U. S. Corps of Engineers Data prepared by the North Central Forest Experiment Station.

	GROWING STOCK	SAWTIMBER
	(Million Cubic Feet)	(Million Board Feet)
1954 2/	1382.0	5092.0
1963 1/	1652.5	6232.0
1968	1831.8	7016.7

A summary of the timber resources for the three subregions shows a volume of growing stock available to industry as of January 1, 1963, of 2,302,100,000 cubic feet and sawtimber volume of 8,554,500,000 board feet.

Timber Volumes for the Mississippi and Missouri River Basins - 1963

(Commercial forest area of 3,914,100 acres, more or less)

Subregion	GROWING STOCK VOLUME (Million Cubic Feet)	SAWTIMBER VOLUME (Million Board Feet)
Davenport-Rock Island-Moline	1095.0	4043.0
Des Moines-Fort Dodge	688.0	2518.0
Missouri River Basin (Subregion 6)	519.1	1993.5
Total Volume	2302.1	8554.5

The annual growth exceeds the annual cut by more than three times for the subregions in the Mississippi River Basin and the annual growth is nearly five times the annual cut for the Missouri River Basin (Subregion 6). An estimated volume for this area as of January 1, 1968 is provided by increasing the rate of growth at 2.5% per year.

Timber Volumes for the Mississippi and Missouri River Basins - 1968

(Commercial forest area of 3,914,100 acres, more or less)

Subregion	GROWING STOCK VOLUME (Million Cubic Feet)	SAWTIMBER VOLUME (Million Board Feet)
Davenport-Rock Island-Moline	1231.8	4548.3
Des Moines-Fort Dodge	774.0	2832.7
Missouri River Basin (Subregion 6)	583.9	2242.1
Total Volume	2589.7	9623.1

1/ Missouri River Basin Study and the Mississippi River Basin Study to be published by the U.S. Corps of Engineers, Data prepared by North Central Forest Experiment Station

2/ U. S. Department of Agriculture, Forest Service, Forest Survey Release Number 22, The Forest Resources of Iowa, 1959.

Cordwood volumes of residue material, other than growing stock, are estimated to be approximately equal to fifty percent of the growing stock volume.

Markets are not available for the Number 3 grade and tie and timber grades throughout much of the state of Iowa and throughout the adjoining subregions.

Inventory data indicates that 32% of the volume of sawtimber growing stock in these subregions is classified as Number 1 and Number 2 grade material and trees in this classification provide for the veneer logs and sawlogs which are harvested annually.

Davenport-Rock Island-Moline Subregion

The Davenport-Rock Island-Moline Subregion comprised of Eastern Iowa and parts of Illinois and Wisconsin has a total forest area of 1,672.3 thousand acres, and of this acreage 1,655.9 thousand acres is commercial forest land. The farmers own 1,621.3 thousand acres and industry and public ownerships own only 24.6 thousand acres. Sawtimber stands are found on 768.2 thousand acres and poletimber stands are on the other 478.9 thousand acres. The stocking of these areas varies from more than 70% stocked to less than 10% stocked. Stands with stocking above 40% account for 937.9 thousand acres.

As of January 1, 1963 the Davenport-Rock Island-Moline Subregion had a sawtimber volume of 4,043 million board feet and a growing stock total volume of 1,095 million cubic feet. The state of Iowa contained 2,806 million board feet of the sawtimber volume in this subregion. This amounted to 69.9% of the sawtimber volume of this subregion. Iowa contained over 67% of the growing stock volume of this subregion.

Of this 4,043 million board feet of sawtimber volume, 42 million board feet was classified as being softwood volume. The volume of hardwood sawtimber in this subregion was 4,022 million board feet and 2,786 million board feet of this volume was classified as a Number 3 log grade or tie and timber grades. This amounted to 69% of the total hardwood volume.

Trees 29" and larger in diameter account for 255 million board feet of sawtimber volume. Sixty-two percent of the volume is contained in trees over 15" DBH and 38% of the volume in trees less than 15" DBH.

The net annual growth of sawtimber from commercial forest land in the Davenport-Rock Island-Moline Subregion amounted to 134,925 thousand board feet in 1962. The growing stock volume produced a net annual growth of 34,424 thousand cubic feet. Timber cut from sawtimber stands amounted to 50,700 thousand board feet in 1962 or 10,300 thousand cubic feet in the growing stock stands.

A comparison of the inventory volume in 1952 and 1962 shows an increase from 3,689 million board feet to 4,043 million board feet. Projections of the volume indicate that the inventory will be 5,933 million board feet by 1980 and 7,930 million board feet by the year 2000.

Davenport-Rock Island-Moline Subregion Forest Data

	Thousand Acres
Land Area:	
Total Land Area	14,579.1
Total Forest Area	1,672.3
Commercial Forest Area	1,655.9
Ownership:	
National Forest Land	00.5
Other Public	33.1
Forest Industry	01.0
Farmer Owned & Misc. Private	1,621.3
Stand Size:	
Sawtimber	768.2
Poletimber	478.9
Seedlings & Saplings	179.7
Non-Stocked	229.1
Stocking:	
70% plus stocked	429.6
40-70% stocked	508.3
10-40% stocked	488.5
Less 10% stocked	229.5

UPPER MISSISSIPPI RIVER BASIN COMPREHENSIVE STUDY - January 1, 1963

Davenport - Rock Island - Moline Subregion IV

Timber volume on commercial forest land by counties and species groups.

	Counties	Growing Stock : Total	Softwoods	Hardwoods	Sawtimber : Total	Softwoods	Hardwoods
			MMCF			Million board feet 1/	
	IOWA						
1	Allamakee	103.0	.3	102.7	399.7	.5	399.2
3	Bremer	9.0	-	9.0	35.9	-	35.9
1	Buchanan	14.3	-	14.3	55.7	.1	55.6
1	Cedar	17.7	.1	17.6	68.6	.1	68.5
3	Chickasaw	10.5	-	10.5	41.6	-	41.6
1	Clayton	94.1	.3	93.8	364.8	.4	364.4
1	Clinton	24.5	.1	24.4	95.0	.1	94.9
1	Delaware	20.2	.1	20.1	78.3	.1	78.2
2	Des Moines	19.5	.1	19.4	68.1	.1	68.0
1	Dubuque	42.8	.1	42.7	166.3	.2	166.1
1	Fayette	29.4	.1	29.3	113.7	.1	113.6
2	Henry	18.2	.1	18.1	63.5	.1	63.4
3	Howard	7.8	-	7.8	30.9	-	30.9
1	Jackson	64.8	.2	64.6	251.4	.3	251.1
1	Johnson	31.0	.1	30.9	120.4	.1	120.3
1	Jones	32.5	.1	32.4	125.7	.1	125.6
2	Lee	39.7	.1	39.6	139.3	.2	139.1
1	Linn	35.9	.1	35.8	139.3	.2	139.1
2	Louisa	20.4	-	20.4	71.6	.1	71.5
1	Muscatine	24.4	.1	24.3	94.4	.1	94.3
1	Scott	11.4	-	11.4	44.2	-	44.2
2	Washington	18.1	.1	18.0	63.1	.1	63.0
1	Winneshiek	45.0	.1	44.9	174.5	.2	174.3
	TOTAL	734.2	2.2	732.0	2,806.0	3.2	2,802.8

UPPER MISSISSIPPI RIVER COMPREHENSIVE BASIN STUDY

Davenport-Rock Island-Moline Economic Subregion (IV)

Timber cut, growth, and inventory of sawtimber on commercial forest land in 1952 and 1962, and projections, 1980-2020.

	Cut			Growth			Inventory 1/		
	All species	Soft-woods	Hard-woods	All species	Soft-woods	Hard-woods	All species	Soft-woods	Hard-woods
	(MM Board feet)								
1952	51	1	50	151	1	150	3,689	19	3,670
1962	51	1	50	135	1	134	4,043	21	4,022
	Projections								
1980	71	2	69	200	2	198	5,933	28	5,905
2000	93	3	90	206	3	203	7,930	33	7,897
2020	113	4	109	193	4	189	9,100	35	9,065

1/ As of January 1, 1953 and 1963.

UPPER MISSISSIPPI RIVER COMPREHENSIVE BASIN STUDY

Davenport-Rock Island-Moline Economic Subregion (IV)

Timber cut, growth, and inventory of growing stock on commercial forest land in 1952 and 1962, and projections 1980-2020.

Year	Cut			Growth			Inventory 1/		
	All species	Soft-woods	Hard-woods	All species	Soft-woods	Hard-woods	All species	Soft-woods	Hard-woods
	(MM Cubic feet)								
1952	12	-	12	37	-	37	990	5	985
1962	10	-	10	34	-	34	1,095	6	1,089
	Projections								
1980	17	1	16	73	-	73	1,884	9	1,875
2000	30	1	29	95	1	94	2,982	14	2,968
2020	49	1	48	101	1	100	4,067	18	4,049

1/ As of January 1, 1953 and 1963.

UPPER MISSISSIPPI RIVER COMPREHENSIVE BASIN STUDY

Davenport-Rock Island-Moline Economic Subregion (IV)

Timber products output in 1952 and 1962, and projections 1980-2020.

Year	Saw logs, veneer logs and minor industrial products 1/	Pulpwood			Fuelwood		
		Total	Roundwood	Plant by-products	Total	Roundwood	Plant by-products
	(M cubic feet)	(M Cords)			(M Cords)		
1952	5,700	4	4	-	199	176	23
1962	7,000	20	17	3	113	98	15
		Projections					
1980	11,800	40	31	9	72	63	9
2000	23,200	58	47	11	62	53	9
2020	42,000	73	57	16	56	47	9

1/ Minor industrial products include cooperage logs, poles, piling, mine timbers, posts, chemical wood, box bolts and a miscellaneous assortment of similar items.

UPPER MISSISSIPPI RIVER COMPREHENSIVE BASIN STUDY - January 1, 1963

Davenport-Rock Island-Moline Economic Subregion (IV)

Volume of growing stock and sawtimber on commercial forest land by species and stand-size classes.

Species	Growing stock			Sawtimber		
	Total	Poletimber	Sawtimber	Total	In sawtimber stands	In other stands
	(MM Cubic feet)			(MM Board feet)		
Hardwoods:						
Select white and red oaks	370	94	276	1,504	1,275	229
Other white and red oaks	57	18	39	188	141	47
Hickory	50	28	22	129	85	44
Yellow birch	-	-	-	-	-	-
Hard maple	43	12	31	151	142	9
Ash, walnut and black cherry	78	24	54	296	252	44
Cottonwood and aspen	71	21	50	289	274	15
Yellow poplar	-	-	-	-	-	-
Other hardwoods	420	120	300	1,465	1,231	234
Total	1,089	317	772	4,022	3,400	622
Softwoods:						
Pine	-	-	-	-	-	-
Spruce and balsam fir	-	-	-	-	-	-
Other softwoods	6	2	4	21	17	4
Total	6	2	4	21	17	4
Total	1,095	319	776	4,043	3,417	626

UPPER MISSISSIPPI RIVER COMPREHENSIVE BASIN STUDY - January 1, 1963

Davenport-Rock Island-Moline Economic Subregion (IV)

Volume of hardwood sawtimber on commercial forest land by species and log grades.

Species	Log grades			
	Total	No. 1	No. 2	No. 3 and tie and timber
	(MM Board feet)			
Select white and red oaks	1,504	101	288	1,115
Other white and red oaks	188	6	16	166
Hickory	129	2	8	119
Yellow birch	-	-	-	-
Hard maple	151	17	23	111
Ash, walnut and black cherry	296	45	75	176
Cottonwood and aspen	289	77	54	158
Yellow poplar	-	-	-	-
Other hardwoods	1,465	204	320	941
Total	4,022	452	784	2,786

UPPER MISSISSIPPI RIVER COMPREHENSIVE BASIN STUDY - January 1, 1963

Davenport-Rock Island-Moline Economic Subregion (IV)

Volume of sawtimber on commercial forest land by species and diameter classes.

Species	Diameter classes (inches)				
	Total	Less than 15.0 1/	15.0 - 10.0	19.0 - 29.0	29.0 and larger
	(MM Board feet)				
Hardwoods:					
Select white and red oaks	1,504	639	459	359	47
Other white and red oaks	188	70	57	54	7
Hickory	129	88	35	6	-
Yellow birch	-	-	-	-	-
Hard maple	151	66	41	40	4
Ash, walnut and black cherry	296	122	94	66	14
Cottonwood and aspen	289	42	44	113	90
Yellow poplar	-	-	-	-	-
Other hardwoods	1,465	476	455	441	93
Total	4,022	1,503	1,185	1,079	255
Softwoods:					
Pine	-	-	-	-	-
Spruce and balsam fir	-	-	-	-	-
Other softwoods	21	13	4	4	-
Total	21	13	4	4	-
Total	4,043	1,516	1,189	1,083	255

1/ Hardwood diameters from 11.0 to 15.0 and softwood diameters from 9.0 to 15.0 inches at breast height.

UPPER MISSISSIPPI RIVER COMPREHENSIVE BASIN STUDY - 1962

Davenport-Rock Island-Moline Economic Subregion (IV)

Net annual growth of growing stock and sawtimber on commercial forest land by species.

Species	Growing stock	Sawtimber
	(M Cubic feet)	(M Board feet)
Hardwoods:		
Select white and red oaks	8,726	39,093
Other white and red oaks	1,592	5,380
Hickory	1,938	5,576
Yellow birch	-	-
Hard maple	1,720	5,898
Ash, walnut and black cherry	2,781	11,655
Cottonwood and aspen	2,678	10,569
Yellow poplar	-	-
Other hardwoods	14,819	55,744
Total	34,254	133,915
Softwoods:		
Pine	-	-
Spruce and balsam fir	-	-
Other softwoods	170	1,010
Total	170	1,010
Total	34,424	134,925

UPPER MISSISSIPPI RIVER COMPREHENSIVE BASIN STUDY - 1962

Davenport-Rock Island-Moline Economic Subregion (IV)

Timber cut from growing stock and sawtimber on commercial forest land by species.

Species	Growing stock	Sawtimber
	(M Cubic feet)	(M Board feet)
Hardwoods:		
Select white and red oaks	3,200	16,600
Other white and red oaks	900	4,100
Hickory	400	1,200
Yellow birch	-	-
Hard maple	200	900
Ash, walnut and black cherry	700	3,900
Cottonwood and aspen	1,100	6,200
Yellow poplar	-	-
Other hardwoods	3,400	16,600
Total	9,900	49,500
Softwoods:		
Pine	100	300
Spruce and balsam fir	-	-
Other softwoods	300	900
Total	400	1,200
Total	10,300	50,700

The Des Moines-Fort Dodge Subregion of Iowa had 2,518 million board feet of timber in 1962. Only 2 million board feet of this volume was classified as softwoods. Of this volume 1,759 million board feet was 15" DBH and larger and 231 million board feet was 24" and larger. Forty percent of the total volume is 19" DBH and larger.

Hardwood sawtimber on commercial forest land in this subregion amounted to 2,516 million board feet and 1,656 million board feet or 65% of this volume was classified as a Number 3 grade or as a tie and timber grade.

In 1962, 29,800 thousand board feet was cut from the sawtimber and 5,900 thousand cubic feet was cut from the growing stock.

The sawtimber had a net annual growth of 87,714 thousand board feet in 1962 and the growing stock had a net annual growth of 20,859 thousand cubic feet.

The 1952 inventory for this subregion showed a volume of 2,029 million board feet and the 1962 inventory indicated a volume of 2,518 million board feet. This amounted to an increase of 489 million board feet during the 10 year period or 24% of the 1952 volume. This indicates a volume increase of 2.4% per year after mortality and cut have been deducted.

Growth projections indicate that the volume in this subregion will be 3,805 million board feet by 1980 and 5,295 million board feet by 2000.

The Des Moines-Fort Dodge Subregion has a total commercial forest area of 1,239.2 thousand acres. State and public ownership has only 17.2 thousand acres, and farmers and private owners account for 1,222.0 thousand acres or 98.6% of the total commercial area.

Sawtimber stands are found on 404.0 thousand acres and poletimber stands are found on 416.3 thousand acres. Seedling, sapling, and non-stocked areas account for 418.9 thousand acres or 33.8% of the commercial forest land.

The stocking of stands show that 268.5 thousand acres is 70% plus stocked and that 640.8 thousand acres or 51.6% of the total commercial area is 40% stocked.

Des Moines-Fort Dodge Subregion Forest Data

	Thousand Acres
Land Area:	
Total Land Area	18,818.7
Total Forest Area	1,251.6
Total Commercial Forest Area	1,239.2
Ownership:	
National Forest Land	1.8
Other Public	15.4
Forest Industry	00.0
Farmer Owned and Misc. Private	1,222.0
Stand Size:	
Sawtimber	404.0
Poletimber	416.3
Seedlings and Saplings	177.2
Non-Stocked	241.7
Stocking:	
70% plus stocked	268.5
40-70% stocked	372.3
10-40% stocked	356.9
Less 10% stocked	241.5

UPPER MISSISSIPPI RIVER COMPREHENSIVE BASIN STUDY

Des Moines - Fort Dodge Economic Subregion (III)

Timber cut, growth, and inventory of sawtimber on commercial forest land in 1952 and 1962, and projections, 1980-2020.

Year	Cut			Growth			Inventory 1/		
	All species	Soft-woods	Hard-woods	All species	Soft-woods	Hard-woods	All species	Soft-woods	Hard-woods
	(MM Board feet)								
1952	31	-	31	73	-	73	2,029	3	2,026
1962	30	1	29	88	-	88	2,518	2	2,516
	Projections								
1980	43	1	42	128	1	127	3,805	5	3,800
2000	56	1	55	129	1	128	5,295	7	5,288
2020	67	1	66	111	1	110	6,245	8	6,237

1/ As of January 1, 1953 and 1963.

UPPER MISSISSIPPI RIVER COMPREHENSIVE BASIN STUDY -

Des Moines - Fort Dodge Economic Subregion (III)

Timber cut, growth, and inventory of growing stock on commercial forest land in 1952 and 1962, and projections, 1980-2020.

Year	Cut			Growth			Inventory 1/		
	All species	Soft-woods	Hard-woods	All species	Soft-woods	Hard woods	All species	Soft-woods	Hard-woods
	(MM Cubic feet)								
1952	7	-	7	19	-	19	567	1	566
1962	6	-	6	21	-	21	688	1	687
	Projections								
1980	10	-	10	53	-	53	1,325	2	1,323
2000	17	-	17	68	-	68	2,156	4	2,152
2020	28	-	28	69	-	69	2,936	5	2,931

1/ As of January 1, 1953 and 1963.

UPPER MISSISSIPPI RIVER COMPREHENSIVE BASIN STUDY

Des Moines - Fort Dodge Economic Subregion (III)

Timber products output in 1952 and 1962, and projections, 1980-2020

Year	Saw logs, veneer logs and minor industrial products 1/	Pulpwood					
		Total	Roundwood	Plant by-products	Total	Roundwood	Plant by-products
	(M cubic feet)		(M cords)			(M cords)	
1952	3,600	1	1	-	132	118	14
1962	4,100	10	9	1	73	64	9
			Projections				
1980	5,300	23	17	6	51	45	6
2000	6,900	33	26	7	44	38	6
2020	8,200	44	33	11	39	34	5

1/ Minor industrial products include cooperage logs, poles, piling, mine timbers, posts, chemical wood, box bolts and a miscellaneous assortment of similar items.

UPPER MISSISSIPPI RIVER COMPREHENSIVE BASIN STUDY - January 1, 1963

Des Moines - Fort Dodge Economic Subregion (III)

Volume of growing stock and sawtimber on commercial forest land by species and stand-size classes.

Species	Growing stock			Sawtimber		
	Total	Poletimber	Sawtimber	Total	In sawtimber stands	In other stands
	(MM Cubic Feet)			(MM Board Feet)		
Hardwoods:						
Select white and red oaks	153	33	120	609	490	119
Other white and red oaks	63	15	48	220	161	59
Hickory	30	17	13	70	47	23
Yellow birch	-	-	-	-	-	-
Hard maple	8	2	6	30	27	3
Ash, walnut and black cherry	47	12	35	180	156	24
Cottonwood and aspen	54	4	50	294	279	15
Yellow poplar	-	-	-	-	-	-
Other hardwoods	332	92	240	1,113	890	223
Total	687	175	512	2,516	2,050	466
Softwoods:						
Pine	-	-	-	-	-	-
Spruce and balsam fir	-	-	-	-	-	-
Other softwoods	1	1	-	2	-	2
Total	1	1	-	2	-	2
Total	688	176	512	2,518	2,050	468

UPPER MISSISSIPPI RIVER COMPREHENSIVE BASIN STUDY - January 1, 1963

Des Moines - Fort Dodge Economic Subregion (III)

Volume of hardwood sawtimber on commercial forest land by species and log grades.

Species	Log Grades			
	Total	No. 1	No. 2	No. 3 and tie and timber
	(MM Board feet)			
Select white and red oaks	609	30	134	445
Other white and red oaks	220	6	24	190
Hickory	70	-	3	67
Yellow birch	-	-	-	-
Hard maple	30	3	5	22
Ash, walnut and black cherry	180	30	49	101
Cottonwood and aspen	294	84	58	152
Yellow poplar	-	-	-	-
Other hardwoods	1,113	156	278	679
Total	2,516	309	551	1,656

UPPER MISSISSIPPI RIVER COMPREHENSIVE BASIN STUDY - January 1, 1963

Des Moines - Fort Dodge Economic Subregion (III)

Volume of sawtimber on commercial forest land by species and diameter classes.

Species	Diameter classes (inches)				
	Total	Less than 15.0 1/	15.0 - 19.0	19.0 - 29.0	29.0 and larger
			(MM Board feet)		
Hardwoods:					
Select white and red oaks	609	206	194	181	28
Other white and red oaks	220	83	65	62	10
Hickory	70	49	19	2	-
Yellow birch	-	-	-	-	-
Hard maple	30	11	8	10	1
Ash, Walnut and black cherry	180	69	59	42	10
Cottonwood and aspen	294	31	42	118	103
Yellow poplar	-	-	-	-	-
Other hardwoods	1,113	308	356	370	79
Total	2,516	757	743	785	231
Softwoods:					
Pine	-	-	-	-	-
Spruce and balsam fir	-	-	-	-	-
Other softwoods	2	2	-	-	-
Total	2	2	-	-	-
Total	2,518	759	743	785	231

1/ Hardwood diameters from 11.0 to 15.0 and softwood diameters from 9.0 to 15.0 inches at breast height.

UPPER MISSISSIPPI RIVER COMPREHENSIVE BASIN STUDY - 1962

Des Moines - Fort Dodge Economic Subregion (III)

Net annual growth of growing stock and sawtimber on commercial forest land by species.

Species	Growing stock	Sawtimber
	(M Cubic feet)	(M Board feet)
Hardwoods:		
Select white and red oaks	3,594	16,687
Other white and red oaks	1,479	6,028
Hickory	1,215	2,996
Yellow birch	-	-
Hard maple	384	1,652
Ash, walnut and black cherry	1,499	7,024
Cottonwood and aspen	1,770	11,125
Yellow poplar	-	-
Other hardwoods	10,880	42,116
Total	20,821	87,628
Softwoods:		
Pine	-	-
Spruce and balsam fir	-	-
Other softwoods	38	86
Total	38	86
Total	20,859	87,714

UPPER MISSISSIPPI RIVER COMPREHENSIVE BASIN STUDY - 1962

Des Moines - Fort Dodge Economic Subregion (III)

Timber cut from growing stock and sawtimber on commercial forest land by species.

Species	Growing stock	Sawtimber
	(M cubic feet)	(M board feet)
Hardwoods:		
Select white and red oaks	1,500	7,500
Other white and red oaks	700	3,300
Hickory	300	800
Yellow birch	-	-
Hard maple	100	400
Ash, walnut and black cherry	400	2,400
Cottonwood and aspen	700	4,100
Yellow poplar	-	-
Other hardwoods	2,100	10,700
Total	5,800	29,200
Softwoods:		
Pine	-	-
Spruce and balsam fir	-	-
Other softwoods	100	600
Total	100	600
Total	5,900	29,800

Subregion 6 of the Missouri River Basin study had sawtimber volumes of 1,996,300 thousand board feet. The charts include an additional volume of 2,800 thousand board feet of sawtimber and 700 thousand cubic feet of growing stock for Adair County which was reported in the Des Moines-Fort Dodge Subregion of the Mississippi River Basin.

Sawtimber stands account for 1,631,100 thousand board feet of the total volume. Growing stock has 391,900 thousand cubic feet in sawtimber stands and 127,900 thousand cubic feet in pole timber stands.

Trees 21" DBH and larger account for 656,800 thousand board feet or 32.9% of the total volume. Trees 17" and up account for 1,187,300 thousand board feet or 59% of the total volume.

The net annual growth of the growing stock of this subregion was 17.2 million cubic feet and the sawtimber produced 75.3 million board feet of growth in 1962. The timber cut from growing stock amounted to 3.7 million cubic feet and from sawtimber 16.8 million board feet. This leaves a volume after cut of 13.5 million cubic feet and 58.5 million board feet to be added to the inventory. The 1953 inventory showed a volume of 1,568.4 million board feet and the 1962 inventory showed a volume of 1,993.5 million board feet. Increase in volume for the ten year period is recorded as 425.1 million board feet. This would give an increase in volume of 2.7% after each year of cut and mortality have been deducted.

Iowa contained 908 million board feet of the sawtimber volume and 230.3 million cubic feet of the growing stock volume in 1962 in Subregion 6.

The Missouri River Basin Subregion 6 has a commercial forest land area of 1,019.0 thousand acres. The following is a breakdown by state of the Sub-region:

COMMERCIAL FOREST LAND (SUBREGION 6)

State	Thousand Acres
Iowa	350.6
Nebraska	355.0
Missouri	193.5
Kansas	113.1
Minnesota	6.8
Total	1019.0

Private ownership accounts for 1,014.0 thousand acres or 99.5% of the total area. Sawtimber stands are on 375.8 thousand acres and poletimber stands are on 265.2 thousand acres. This leaves 378.0 thousand acres classified as seedling, sapling, and non-stocked areas.

Source: Missouri River Basin Study to be published by the U. S. Corps of Engineers. Data prepared by North Central Forest Experiment Station.

The following charts indicate the volume of growing stock and sawtimber by state within the Missouri River Basin (Subregion 6) - 1962.

	GROWING STOCK (Cubic Feet)	SAWTIMBER only (Board Feet)
Iowa	230,300,000	908,000,000
Kansas	49,200,000	177,200,000
Minnesota	3,600,000	14,800,000
Missouri	58,700,000	214,600,000
Nebraska	177,300,000	678,900,000
Total	519,100,000	1,993,500,000

Source: Missouri River Basin Study to be published by the U. S. Corps of Engineers, Data prepared by North Central Forest Experiment Station.

MISSOURI RIVER BASIN STUDY - 1962

Western Iowa - Nebraska Subregion (6)

Area of commercial forest land, by ownership classes.

Subarea	Subregion 6
Ownership Class	Thousand Acres
Federal:	
National Forest	
Bureau of Land Management	
Other Federal	.7
Total Federal	.7
State, County & Municipal	4.3
Private:	
Indian	5.6
Forest Industry	
Other private, 1/	1,008.4
Total private	1,014.0
All ownerships	1,019.0

1/ Includes farmer-owned

MISSOURI RIVER BASIN STUDY

Western Iowa - Nebraska Subregion (6)

Area by Land Classes

Subarea _____ Subregion 6

Land Class	Thousand Acres
Commercial Forest Land	1,019.0
Noncommercial Forest Land	16.7
Productive Reserved	7.5
Unproductive Reserved	-
Unproductive Nonreserved	9.2
Total Forest Land	1,035.7
Nonforest Land	21,085.0 1/
All Land	22,120.7 2/

1/ Includes 4,000 acres of water according to Survey standards of area classification but defined by Bureau of the Census as land.

2/ From U. S. Bureau of the Census, Land and Water Area of the United States, 1960.

MISSOURI RIVER BASIN STUDY - 1962

Western Iowa - Nebraska Subregion (6)

Area of commercial forest land, by stand-size and ownership classes.

Subarea Stand-size class	All ownership	National Forest	Other public	Forest industry	Farmer and misc. private
	(---------- Thousand acres ----------)				
Sawtimber stands: 1/					
Old growth					
Young Growth	375.8	-	.8	-	375.0
Total	375.8	-	.8	-	375.0
Poletimber stands	265.2	-	2.8	-	262.4
Sapling and seedling stands	105.7	-	.7	-	105.0
Nonstocked areas	272.3	-	.7	-	271.6
All classes	1,019.0	-	5.0	-	1,014.0

1/ Breakdown by old and young growth required only in the West.

MISSOURI RIVER BASIN STUDY

Western Iowa - Nebraska Subregion (6)

Area by Land Classes

Subarea _____ Subregion 6 (Iowa)

Land Class	Thousand Acres
Commercial Forest Land	350.6
Noncommercial Forest Land	3.4
Productive Reserved	3.4
Unproductive Reserved	-
Unproductive Nonreserved	-
Total Forest Land	354.0
Nonforest Land	8,686.9 1/
All Land	9,040.0 2/

1/ Includes _____ acres of water according to Survey standards of area classification but defined by Bureau of the Census as land.

2/ From U. S. Bureau of the Census, Land and Water Area of the United States, 1960

MISSOURI RIVER BASIN STUDY

Western Iowa - Nebraska Subregion (6)

Area by Land Classes

Subarea _____ Subregion 6 (Kansas)

Land Class	Thousand Acres
Commercial Forest Land	113.1
Noncommercial Forest Land	4.5
Productive Reserved	-
Unproductive Reserved	-
Unproductive Nonreserved	4.5
Total Forest Land	117.6
Nonforest Land	1,633.4 1/
All Land	1,751.0 2/

1/ Includes _____ acres of water according to Survey standards of area classification but defined by Bureau of the Census as land.

2/ From U. S. Bureau of the Census, Land and Water Area of the United States, 1960.

MISSOURI RIVER BASIN STUDY

Western Iowa - Nebraska Subregion (6)

Area by Land Classes

Subarea _____ Subregion 6 (Minnesota)

Land Class	Thousand Acres
Commercial Forest Land	6.8
Noncommercial Forest Land	0.4
Productive Reserved	-
Unproductive Reserved	-
Unproductive Nonreserved	0.4
Total Forest Land	7.2
Nonforest Land	1,055.9 1/
All Land	1,063.1 2/

1/ Includes _____ acres of water according to Survey standards of area classification but defined by Bureau of the Census as land.

2/ From U. S. Bureau of the Census, Land and Water Area of the United States, 1960.

MISSOURI RIVER BASIN STUDY

Western Iowa - Nebraska Subregion (6)

Area by Land Classes

Subarea _____ Subregion 6 (Missouri)

Land Class	Thousand Acres
Commercial Forest Land	193.5
Noncommercial Forest Land	1.3
Productive Reserved	0.6
Unproductive Reserved	-
Unproductive Nonreserved	0.7
Total Forest Land	194.8
Nonforest Land	1,547.9 1/
All Land	1,742.7 2/

1/ Includes _____ acres of water according to Survey standards of area classification but defined by Bureau of the Census as land.

2/ From U. S. Bureau of the Census, Land and Water Area of the United States, 1960.

MISSOURI RIVER BASIN STUDY

Western Iowa - Nebraska Subregion (6)

Area by Land Classes

Subarea _____ Subregion 6 (Nebraska)

Land Class	Thousand Acres
Commercial Forest Land	355.0
Noncommercial Forest Land	7.1
Productive Reserved	3.5
Unproductive Reserved	-
Unproductive Nonreserved	3.6
Total Forest Land	362.1
Nonforest Land	8,160.9 1/
All Land	8,523.0 2/

1/ Includes _____ acres of water according to Survey standards of area classification but defined by Bureau of the Census as land.

2/ From U. S. Bureau of the Census, Land and Water Area of the United States, 1960.

MISSOURI RIVER BASIN STUDY

Western Iowa - Nebraska Subregion (6)

Timber cut, growth, and inventory of sawtimber on commercial forest land in 1952 and 1962, and projections, 1980-2020. 2/

Year	Inventory 1/			Growth 2/			Cut 3/		
	All species	Soft-woods	Hard-woods	All species	Soft-woods	Hard-woods	All species	Soft-woods	Hard-woods
				(M board feet)					
1952	1,571,200	-	1,571,200	64,300	-	64,300	26,600	-	26,600
1962	1,996,300	-	1,996,300	75,300	-	75,300	16,806	64	16,742
				Projections					
1980	2,770,500	-	2,770,500	81,400	-	81,400	44,000	-	44,000
2000	3,419,700	-	3,419,700	94,100	-	94,100	66,600	-	66,600
2020	3,733,300	-	3,733,300	101,900	-	101,900	98,000	-	98,000

1/ As of January 1, 1953 and 1963.

2/ The growth in 1962 is gross growth reduced by current mortality. For other years growth is reduced by average mortality.

3/ The cut in 1962 is timber harvested. For other years it also includes volume "lost" due to flooding, land clearing and land reclassification.

MISSOURI RIVER BASIN STUDY

Western Iowa - Nebraska Subregion (6)

Timber cut, growth, and inventory of growing stock on commercial forest land in 1952 and 1962 and projections 1980-2020. 2/

	Inventory 1/			Growth 2/			Cut 3/		
	All species	Soft-woods	Hard-woods	All species	Soft-woods	Hard-woods	All species	Soft-woods	Hard-woods
	(M cubic feet)								
1952	417,400	300	417,100	14,700	*	14,700	6,600	*	6,600
1962	519,800	400	519,400	17,180	20	17,160	3,698	13	3,685
	Projections								
1980	786,400	400	786,000	24,900	-	24,900	8,000	-	8,000
2000	1,147,400	400	1,147,000	34,300	-	34,300	15,100	-	15,100
2020	1,506,400	400	1,506,000	43,300	-	43,300	26,600	-	26,600

1/ As of January 1, 1953 and 1963.

2/ The growth in 1962 is gross growth reduced by current mortality. For other years growth is reduced by average mortality.

3/ The cut in 1962 is timber harvested. For other years it also includes volume "lost" due to flooding, land clearing and land reclassification.

MISSOURI RIVER BASIN STUDY

Western Iowa - Nebraska Subregion (6)

Timber products output in 1952 and 1962, and projections 1980-2020.

(M Cubic feet)

Year	Total output	Sawlogs	Veneer Logs	Pulpwood			Fuelwood			All other industrial wood products 1/
				Total	Roundwood	Plant by-products	Total	Roundwood	Plant by-products	
1952	6,165	1,358	233	-	-	-	4,189	3,752	437	385
1962	6,401	1,764	255	-	-	-	3,963	3,592	371	419
Projections										
1980	6,860	2,790	330	490	440	50	2,540	2,300	240	710
2000	7,930	3,580	410	780	700	80	1,860	1,690	170	1,300
2020	9,970	4,620	440	1,230	1,105	125	1,500	1,360	140	2,180

1/ Includes: excelsior bolts, shingle bolts, turnery bolts, chemical wood, cooperage logs, poles, piling, mine timbers, posts, box bolts and a miscellaneous assortment of similar items.

MISSOURI RIVER BASIN STUDY - 1962

Western Iowa - Nebraska Subregion (6) 1/

Volume of growing stock and sawtimber on commercial forest land by species and stand-size classes.

Species	Growing stock			Sawtimber		
	Total	Poletimber	Sawtimber	Total	In sawtimber stands	In other stands
	(M cubic feet)			(M board feet)		
Softwoods:						
Douglas fir						
Ponderosa pine						
True firs						
Spruce						
Lodgepole pine						
Southern pines						
Eastern red cedar	300	300	-			
Other softwoods 2/	100	100	-			
Total softwoods	400	400	-			
Hardwoods:						
Select oaks	61,700	19,400	42,300	224,700	175,200	49,500
Other oaks	49,600	15,200	34,400	165,100	126,200	38,900
Hickory	13,200	6,500	6,700	40,900	34,700	6,200
Ash and walnut	48,800	13,100	35,700	181,400	148,000	33,400
Cottonwood & aspen	141,200	30,400	110,800	545,900	489,700	56,200
Other hardwoods	204,900	42,900	162,000	838,300	657,300	181,000
Total hardwoods	519,400	127,500	391,900	1,996,300	1,631,100	365,200
Total Subregion	519,800*	127,900	391,900	1,996,300*	1,631,100	365,200

1/ Show data by subarea where data are available or significant, otherwise by Subregion.

2/ Other softwoods include: tamarack

* Includes Adair County.

MISSOURI RIVER BASIN STUDY - 1962

Western Iowa - Nebraska Subregion (6)

Volume of sawtimber on commercial forest land by species and diameter classes.

Species	All classes	Diameter Class (Inches at breast height) 9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0 & larger
				Thousand board feet 1/				
Softwoods:								
Douglas fir								
Ponderosa pine								
True firs								
Spruce								
Lodgepole pine								
Southern pines								
Eastern red cedar								
Other softwoods								
Total softwoods								
Hardwoods:								
Select oaks	224,700	xxxxx	40,900	39,800	35,400	30,400	37,400	40,800
Other oaks	165,100	xxxxx	24,400	32,500	24,600	16,400	17,400	49,800
Hickory	40,900	xxxxx	12,000	8,400	6,600	5,200	5,600	3,100
Ash and walnut	181,400	xxxxx	30,100	41,200	40,300	26,000	24,600	19,200
Cottonwood & Aspen	545,900	xxxxx	41,900	58,200	62,000	69,300	59,300	255,200
Other hardwoods	838,300	xxxxx	93,600	100,700	116,400	111,600	127,300	288,700
Total hardwoods	1,996,300	xxxxx	242,900	280,800	285,300	258,900	271,600	656,800
All species:	1,996,300		242,900	280,800	285,300	258,900	271,600	656,800

1/ International 1/4-inch rule

MISSOURI RIVER BASIN STUDY - 1962

Western Iowa - Nebraska Subregion (6) 1/

Net annual growth of growing stock and sawtimber on commercial forest land by species.

Species	Growing stock	Sawtimber
	(M cubic feet)	(M board feet)
Softwoods:		
Douglas fir		
Ponderosa pine		
True firs		
Spruce		
Lodgepole pine		
Southern pines		
Eastern red cedar	20	-
Other softwoods 2/		
Total softwoods	20	-
Hardwoods:		
Select oaks	1,960	8,960
Other oaks	1,680	6,400
Hickory	640	1,870
Ash and walnut	1,820	7,690
Cottonwood and aspen	4,080	18,840
Other hardwoods	6,980	31,540
Total hardwoods	17,160	75,300
Total Subregion	17,180	75,300

1/ Show data by subareas where data are available or significant, otherwise by Subregions

2/ Other softwoods include: (list species)--

MISSOURI RIVER BASIN STUDY - 1962

Western Iowa - Nebraska Subregion (6)

Timber cut from growing stock and sawtimber on commercial forest land by species.

Species	Growing stock	Sawtimber
	(M Cubic feet)	(M board feet)
Softwoods:		
Douglas fir		
Ponderosa pine		
True firs		
Spruce		
Lodgepole pine		
Southern pines		
Eastern red cedar	13	64
Other softwoods 1/		
Total softwoods	13	64
Hardwoods:		
Select oaks	634	2,889
Other oaks	30	76
Hickory	68	221
Ash and walnut	651	3,083
Cottonwood and aspen	837	5,101
Other hardwoods	1,465	5,372
Total hardwoods	3,685	16,742
Total Subregion	3,698	16,806

1/ Other softwoods include: (list species)--

Timber Resource Data of Nebraska

Subregion 6 of the Missouri River Basin includes the eastern portion of the state of Nebraska and the forest resources of the entire state can be transported economically to the forest industrial plants located, for example, in Sioux City or Council Bluffs, Iowa. These cities are suggested as potential sites for additional manufacturing facilities.

In Nebraska the volume of sawtimber and roundwood suitable for pulping and chipping processes increases at a rate of more than three times the volume of timber removed each year by forest industry and annual mortality. In addition to soft hardwood species, relatively large volumes of Ponderosa Pine can be transported economically to industrial plants located at selected sites within the state of Iowa. These Pine products may be used to provide desirable proportions in the use of hardwood species in connection with respective pulp plant needs.

At the present time forest products are being exported from Nebraska to the state of Iowa and the annual net growth of the sawtimber class material is greater than the net growth of the growing stock as it exceeds the annual cut by nearly four times based upon the following figures.

	Growing Stock Cubic Feet	Sawtimber only Board Feet
1955 1/	377,100,000	1,437,300,000
1963 2/	437,000,000	1,672,000,000
1968	481,100,000	1,856,700,000

The cities of Sioux City and Council Bluffs are well served by major railroads and highways which extend throughout the state of Nebraska.

1/ U. S. Department of Agriculture, Forest Service, Forest Survey Release Number 4, The Forest Resources of Nebraska, June 1961.

2/ U. S. Department of Agriculture, Forest Service, Forest Resources Report Number 17, Timber Trends in the United States, 1965.

The volume of growing stock and sawtimber for the years 1955 and 1963 and an estimate by projection for 1968 for the state of Nebraska. 1/ and 2/

STATE OF NEBRASKA - 1955

(Total commercial forest land area 1,050,000 acres)

	GROWING STOCK (cubic feet)	SAWTIMBER (board feet)
Softwoods:		
1955	80,700,000	298,200,000
1963	104,000,000	423,000,000
1968	122,700,000	533,400,000
Hardwoods:		
1955	296,400,000	1,139,100,000
1963	333,010,000	1,249,000,000
1968	358,400,000	1,323,300,000

1/ U.S. Department of Agriculture, Forest Service, Forest Survey Release Number 4, The Forest Resources of Nebraska, June 1961.

2/ U.S. Department of Agriculture, Forest Service, Forest Resources Report Number 17, Timber Trends in the United States, 1965.

A comparison of the net annual growth and cut for the years 1955 and 1962 in the state of Nebraska is shown by the following chart.

	GROWING STOCK		SAWTIMBER	
	Net Annual Growth	Annual Cut	Net Annual Growth	Annual Cut
	(Million Cubic Feet)		(Million Board Feet)	
Softwoods				
1955 1/	3.0	0.1	15.5	0.4
1962 2/	3.4	0.5	18.6	1.2
Hardwoods				
1955	11.0	3.9	39.3	17.8
1962	8.1	3.2	39.2	14.5

1/ U. S. Department of Agriculture, Forest Service, Forest Survey Release Number 4, The Forest Resources of Nebraska, June 1961.

2/ U. S. Department of Agriculture, Forest Service, Forest Resources Report Number 17, Timber Trends in the United States, 1965.

NEBRASKA STUMPAGE PRICES BY GRADE OF LOGS - NOVEMBER 1967 1/

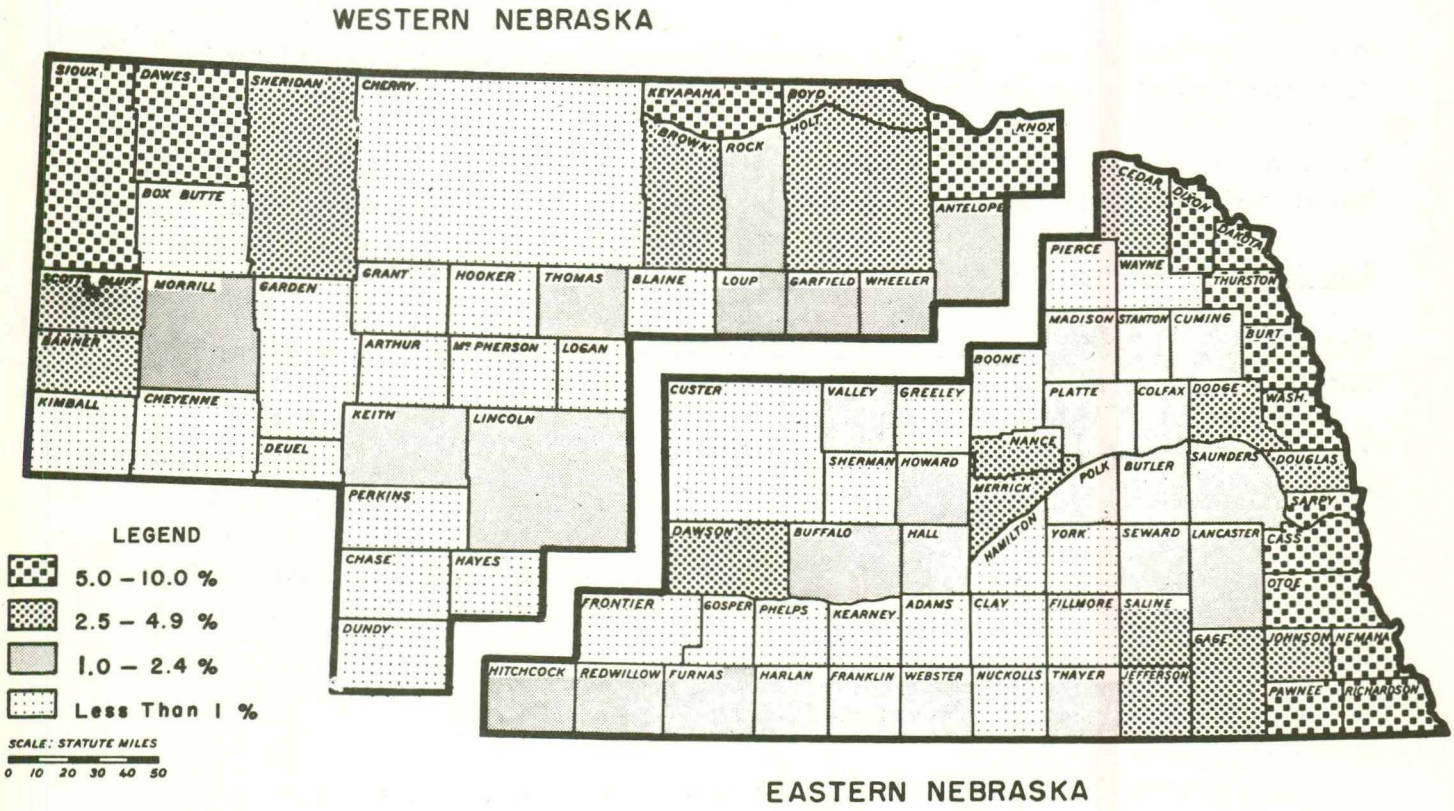
Species	Grade	Min. Length	Min. D.B.H.	Specifications	Price (MBF)
Ash	1	8	18	Veneer use, perfectly clear	$15.00
	2	6	14	Less than 4 clear faces	8.00
Basswood	1	8	18	Straight grain, no defects	20.00
	2	8	16	3 clear faces, no evidence of insects	12.50
	3	6	14	Rough - but not hollow	5.00
Bur Oak	1	8	16	Sawtimber - Straight, no twist	10.00
	2	6	20	Cooperage - clear, no twist, pin knots, fire scars, borers, or bird peck. Minimum of 3 cuts. Not growing in fence row.	.50 C.F.
	3	6	18	Cooperage - No spiral, limited pin knots on 1 face only. 75% of cut usable for bourbon grade heads. Minimum of 3 cuts.	35.00 .30 C.F.
Cottonwood	1	8	16	Veneer - 4 clear faces	10.00
	2	8	16	Lumber	5.00
Elm	1	8	16	Veneer - Sound & clear - Red	45.00
				Sound & clear - White	15.00
	2	8	16	Lumber	5.00
Hackberry	1	8	18	Veneer - 4 clear faces	15.00
	2	8	18	Lumber - Minimum of 2 clear faces, sound knots only.	10.00
	3	6	16	Rough lumber	5.00
Hardwood	-	4	-	4" d.i.b. top. No dog legs or iron. Hedge and honeylocust not acceptable	1/cord
Maple	1	8	20	Straight logs, no defects, 4 clear faces	35.00
	2	8	16	Straight logs, no defects, 4 clear faces	25.00
	3	6	16	Minimum of 2 clear faces	15.00
	4	6	16	Rough lumber	5.00

Species	Grade	Min. Length	Min. D.B.H.	Specifications	Price (MBF)
Pine	-	8	16	Lumber - to 12" top	$ 8.00
Pine	-	8'4"	-	Pulpwood - no fire scars or insect damage 4" d.i.b. top	1.25/cord
Red Cedar	-	6	10	To 6" top (Cedars which have been artifically pruned are unmarketable)	20-30.00
Walnut	Export #1	8	24	Straight - perfectly clear, butt logs	1000.00
	Export #2	8	18	Straight - perfectly clear, butt logs	750.00
	Prime	8	16	Straight - Sound knots permitted on 1 face if they fall within 1 foot of the end of the log. Must have 3 perfect faces - butt knots	450.00
	Select	6	16	Straight - sound knots permitted on two faces	225.00
	#2	6	14	Reasonably straight, tight bark no iron	60.00
	Cull	6	13	Any logs not meeting the upper grades	15.00

Deductions

1. If landowner insists on having slash piled, deduct $3/MBF.
2. Effect of logging chance on stumpage price will be left to the forester's judgment.
3. Evidence of iron in any species except walnut will make the tree unmerchantable. For walnut, it is classed as cull.

1/ Nebraska State Forester's Office, University of Nebraska, Lincoln, Nebraska



Percentage of land forested by county in eastern and western Nebraska, 1955.

Timber Resources of Northeast Nebraska 1/

A brief summary of this subject should be of interest to any forest industry which may consider Sioux City as a potential plant site. The heaviest concentration of hardwood timber for the state of Nebraska lies in the eastern portion and along the Missouri River.

What is Timber Resource

The timber resource is hardwood timber - - 60,000 acres.

The present volume is about 100,000,000 board feet of sawtimber, 11 inches, diameter breast high, and over in diameter.

The hardwood timber is primarily cottonwood and elm type. Oak, hichory, basswood, hackberry and other hardwood species are found in some areas.

The Area

The timbered area is located along the Missouri River and adjoining creeks and river beds.

The timber is found mainly along the river bottomland, but some is located on the river bluffs.

This volume (100 million board feet) of timber is found in Dixon, Dakota, Cedar and Burt Counties of Nebraska. This area is located within 50 miles of Sioux City, Iowa.

Future Timber Potential

The area presently has about 20 million cubic feet of growing stock.

The volumes of growing stock will depend on future land use. The timber area (bottomland area) along the Missouri River is being cleared for agricultural land.

Possible Markets for the Timber

The timber can be used in various wood-using industries. A few uses are crating material, pallets, wood chips, furniture, snow fence, fuelwood and pulpwood.

Veneer timber can be found in most areas.

The timbered area also has a potential as a recreational use area.

1/ Cooperative Extension Service, College of Agriculture , Lincoln, Nebraska, (No date given)

Along the Platte River in Lincoln, Dawson, and Buffalo Counties, Nebraska are to be found large volumes of soft hardwoods which are highly in demand. The mature timber stands between North Platte and Cozad average between 5,000 and 8,000 board feet per acre of Cottonwood-Willow.

In other regions, low lying bottomland areas such as these have been denuded of timber and the lands developed for agricultural purposes. The following types provide more than 50% of ground cover except for a portion in Lincoln County and are well stocked with comparatively high volumes of cordwood.

Timber areas along Platte River by Counties 1/

County	Type	Acres
Lincoln	Mature Cottonwood-Willow	6311
	Mature Mixed-Hardwoods: Cottonwood, Willow, Elm, Ash, Hackberry, Boxelder	2885
	Poles and young timber, Cottonwood-Willow	1485
	Poles and young timber, Mixed-Hardwoods	1000
	Reproduction, Cottonwood-Willow, seedlings and saplings	490
	Reproduction, Mixed-Hardwoods, seedlings and saplings	5435
	Reproduction, Mixed-Hardwoods, less than 40% ground cover	3600
Dawson	Mature Cottonwood-Willow	5000
	Poles and young timber, Cottonwood-Willow	7185
	Reproduction, Cottonwood-Willow, seedlings and saplings	7040
Buffalo	Mature Cottonwood-Willow	783
	Poles and young timber, Cottonwood-Willow	2663
	Reproduction, Mixed-Hardwoods, seedlings and saplings	5280
Total		49,157

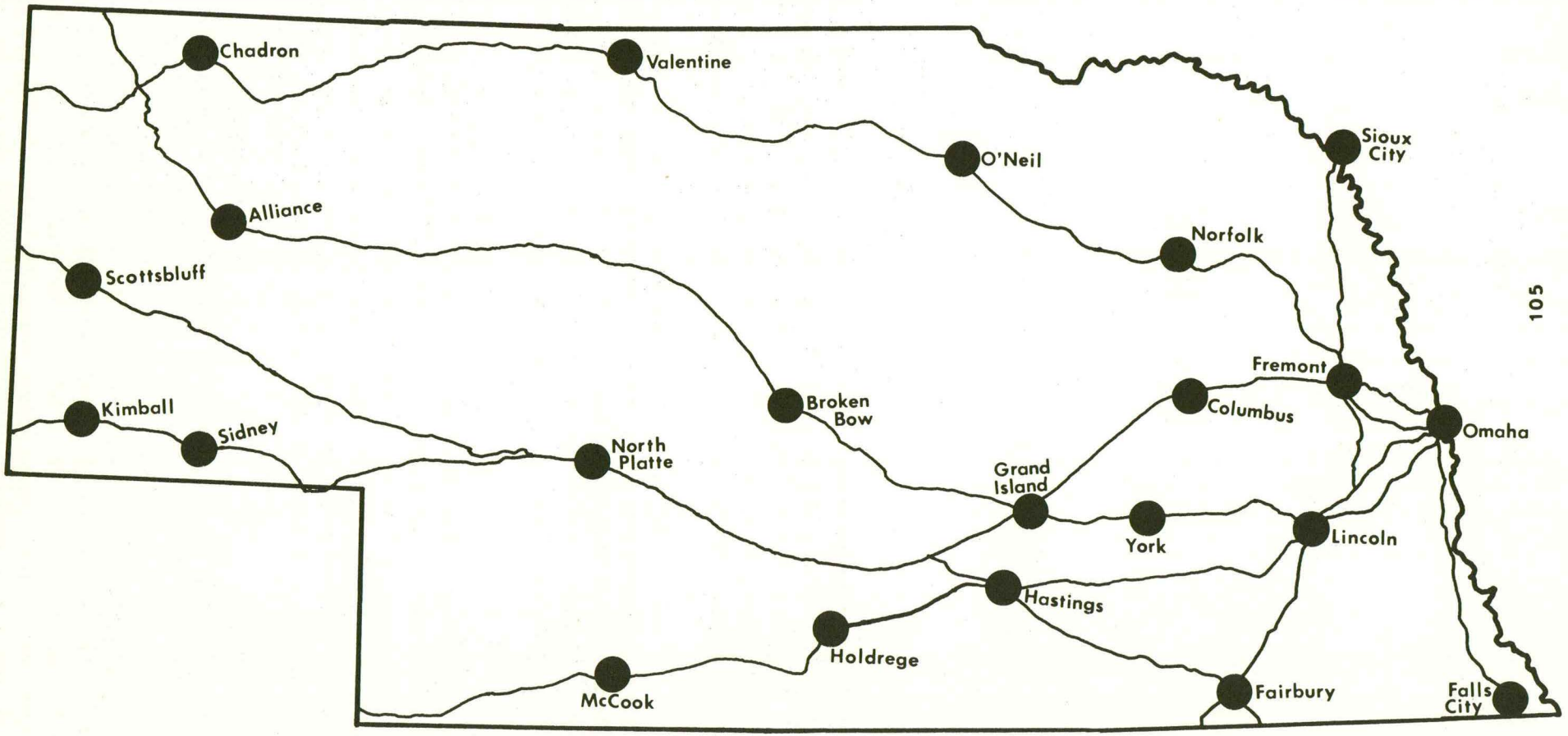
1/ Cooperative Extension Service, College of Agriculture, Lincoln, Nebraska, 1968

The state of Nebraska has a total acreage of 49,064,000 acres and 2.16% or 1,050 thousand acres is classed as commercial forest land. Here, too, farmers and private owners control 91.2% of the commercial forest acreage or 958,200 acres. The Elm-Ash-Cottonwood type is found on 627,600 acres or 59.7% of the commercial forest area. The Ponderosa Pine type is the next largest forest type and is found on 258,500 acres or 24.6% of the commercial forest area. The Oak-Hickory, Bur Oak, and the Hardwood Red Cedar are the three other major timber types recognized in the state and they account for the balance of 15.7% of the commercial forest area.

The state of Nebraska at the present time has a total growing stock of 481.1 million cubic feet of growing stock and 1,856.7 million board feet of sawtimber. It is estimated that softwoods have a volume of growing stock of 22.7 million cubic feet or 25.5% of the total volume and hardwoods have a growing stock volume of 388.4 million cubic feet. The hardwood sawtimber volume amounts to 1,323.3 million board feet or 71.3%, and the softwoods account for 533.4 million board feet or 28.7% of the whole.

In 1962, the net annual growth of growing stock in the state of Nebraska was 11.5 million cubic feet and the annual cut amounted to only 3.7 million cubic feet. The volume increase after cut was 7.8 million cubic feet or an increase of 1.8% of the total volume. The sawtimber volume had a net annual growth of 57.8 million board feet or 3.4% of the gross volume in 1962.

An excellent example of the relatively low cost of transportation facilities is in the shipment by rail of pulpwood from the Pine Ridge area in Northwest Nebraska through the state of Iowa to Wisconsin plants. Wood products grown in Nebraska and Eastern South Dakota can readily furnish raw material to supplement timber which is being grown in Western Iowa along the Missouri River.



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NEBRASKA'S RAILROADS

	Thousand acres
Land Area:	
Total Acres	49,064
Total Forest Land	1,072
Total Commercial Forest Land	1,050
Ownership:	
National Forest and Related Lands	58.0
Federal owned or administered	22.7
State, county, and municipal	11.5
Forest Industry	0.0
Farmer Owned	819.6
Miscellaneous	138.6
Forest Types:	
Ponderosa Pine	258.5
Oak-Hickory	20.0
Elm-Ash-Cottonwood	627.6
Bur Oak	114.1
Hardwood-Red Cedar	30.2

Area of commercial forest land by forest type and stand-sized class, Nebraska, 1955

Forest types	All classes		Large sawtimber stands	Small sawtimber stands	Poletimber stands	Seedling and sapling stands	Non-stocked 1/
	M acres	Percent	(M acres)				
Ponderosa pine	258.5	24.6	13.6	45.5	122.0	23.2	54.2
Oak-hickory	20.0	1.9	4.0	0	11.9	4.1	0
Elm-ash-cottonwood	627.6	59.7	144.0	42.1	120.3	69.4	251.8
Bur oak	114.1	10.9	5.1	6.0	51.3	4.1	47.6
Hardwood-red cedar	30.2	2.9	0	0	12.8	5.8	11.6
All types	2/1,050.4	100.0	166.7	93.6	318.3	106.6	365.2
			(Percent)				
			15.9	8.9	30.3	10.1	34.8

1/ Plus areas not classified elsewhere.

2/ Includes small acreages of planted jack pine in the ponderosa pine type, aspen-birch in the elm-ash-cottonwood type, and pure red cedar in the hardwood-red cedar type.

Sawtimber stands in Nebraska in 1955 contained 1,437.3 million board feet and growing stock stands had 377.1 million cubic feet.

Net volume of live sawtimber and growing stock on commercial forest land, by major species groups and stand-sized classes, Nebraska, 1955.

Stand-sized class	Sawtimber			Growing Stock		
	Total	Softwoods	Hardwoods	Total	Softwoods	Hardwoods
	Million board feet			Million cubic feet		
Sawtimber stands:						
Large	859.8	61.3	798.5	168.8	11.5	157.3
Small	266.3	119.3	147.0	73.6	31.6	42.0
Total	1,126.1	180.6	945.5	242.4	43.1	199.3
Poletimber stands	165.9	82.8	83.1	96.4	30.2	66.2
Seedling and sapling stands	33.8	8.6	25.2	9.9	1.9	8.0
Nonstocked, plus areas not classified elsewhere	111.5	26.2	85.3	28.4	5.5	22.9
Total	1,437.3	298.2	1,139.1	377.1	80.7	296.4

In 1955, 58.7% of the volume in the state was classified as being #3 log grade. This amounts to 841.3 million board feet. Log grade #1 accounted for 18.9% of 270.0 million board feet and log grade #2 accounted for 22.4% or 320.9 million board feet.

Net volume of live sawtimber by selected species and log grades 1/, Nebraska, 1955.

Selected species	Volume	Log grade 1		Log grade 2		Log grade 3	
	Million bd. ft. 2/	Million bd. ft. 2/	%	Million bd. ft. 2/	%	Million bd. ft. 2/	%
Ponderosa pine	293.1	14.6	5.0	48.4	16.5	230.1	78.5
American elm	130.2	1.7	1.3	56.4	43.3	72.1	55.4
Slippery elm	87.5	17.0	19.4	24.1	27.6	46.4	53.0
Cottonwood	605.4	185.9	30.7	123.5	20.4	296.0	48.9
Bur oak	92.6	4.5	4.9	22.2	24.0	65.9	71.1
Ash	103.4	11.6	11.2	13.0	12.6	78.8	76.2
Other hardwoods	120.0	34.7	28.9	33.3	27.8	52.0	43.3
All species 3/	1,432.2	270.0	18.9	320.9	22.4	841.3	58.7

1/ See definitions of log grades for differences between softwood and hardwood grades.

2/ International 1/4-inch rule.

3/ Does not include 4.4 million board feet of eastern red cedar nor 0.7 million board feet of jack pine.

The state of Iowa has need of large supplies of wood products in quantities which are greater than can be produced by the state's wood using industries. In addition to hardwood material shipped from the south and softwood products shipped from the far west, the state may make good use of both finished and raw material imported from the areas immediately adjoining the state. This is particularly true of southeastern Wisconsin, southern Minnesota, eastern Illinois, and northern Missouri.

Forest management has also been initiated on the commercial lands presently under the supervision of the National Wildlife Refuges. An estimated volume of 2,620,000 board feet is available annually from the 44,235 acres located in these regions.

Transportation rates permit the shipment of raw material for long distances and permit the shipment of softwood species from the western states included within the Missouri River Basin. This softwood may be mixed with hardwood in desirable proportions and charts of Subregions 3 through 8 (excluding Subregion 6) provide an estimate of the volumes.

MISSOURI RIVER BASIN STUDY - 1962

Subregion 3

Volume of growing stock and sawtimber on commercial forest land by species and stand-size classes.

Species	Growing stock			Sawtimber		
	Total	Poletimber	Sawtimber	Total	In sawtimber stands	In other stands
	(M cubic feet)			(M board feet)		
Softwoods:						
Douglas fir						
Ponderosa pine	15,700	7,100	8,600	46,400	31,400	15,000
True firs						
Spruce						
Lodgepole pine						
Southern pines						
Eastern red cedar						
Other softwoods						
Total softwoods	15,700	7,100	8,600	46,400	31,400	15,000
Hardwoods:						
Select oaks	4,000	1,700	2,300	11,500	8,500	3,000
Other oaks						
Hickory						
Ash and walnut	15,300	8,500	6,800	32,500	21,900	10,600
Cottonwood and Aspen	46,500	14,900	31,600	163,500	149,200	14,300
Other hardwoods	26,100	9,000	17,100	87,600	75,200	12,400
Total hardwoods	91,900	31,100	57,800	295,100	254,800	40,300
Total Subregion	107,600	41,200	66,400	341,500	286,200	55,300

MISSOURI RIVER BASIN STUDY - 1962

Subregion 4

Volume of growing stock and sawtimber on commercial forest land by species and stand-size classes.

Species	Growing stock			Sawtimber		
	Total	Poletimber	Sawtimber	Total	In sawtimber stands	In other stands
	(M cubic feet)			(M board feet)		
Softwoods:						
Douglas fir						
Ponderosa pine						
True firs						
Spruce						
Lodgepole pine						
Southern pines						
Eastern red cedar						
Other softwoods						
Total softwoods						
Hardwoods:						
Select oaks	6,100	3,900	2,200	10,500	2,700	7,800
Other Oaks	-	-	-	-	-	-
Hickory	-	-	-	-	-	-
Ash and walnut	14,100	8,500	5,600	24,500	18,800	5,700
Cottonwood and Aspen	36,100	18,100	18,000	99,000	83,700	15,300
Other hardwoods	17,800	8,700	9,100	44,200	33,000	11,200
Total hardwoods	74,100	39,200	34,900	178,200	138,200	40,000
Total Subregion	74,100	39,200	34,900	178,200	138,200	40,000

MISSOURI RIVER BASIN STUDY - 1962

Subregion 5

Volume of growing stock and sawtimber on commercial forest land by species and stand-size classes.

Species	Growing stock			Sawtimber		
	Total	Poletimber	Sawtimber	Total	In sawtimber stands	In other stands
	(M cubic feet)			(M board feet)		
Softwoods:						
Douglas fir						
Ponderosa pine	98,000	19,000	79,000	416,000	256,000	160,000
True firs						
Spruce						
Lodgepole pine						
Southern pines						
Eastern red cedar	5,000	4,200	800	6,000	200	5,800
Other softwoods	1,000	800	200	1,000	-	1,000
Total softwoods	104,000	24,000	80,000	423,000	256,200	166,800
Hardwoods:						
Select oaks	12,700	7,300	5,400	23,000	12,400	10,800
Other oaks	200	-	200	500	300	200
Hickory	200	-	200	900	-	900
Ash and Walnut	11,100	3,300	7,800	34,600	25,800	8,800
Cottonwood and Aspen	51,400	7,500	43,900	218,400	198,200	20,200
Other hardwoods	20,500	6,200	14,300	63,300	44,200	19,100
Total hardwoods	96,100	24,300	71,800	340,900	280,900	60,000
Total Subregion	200,100	48,300	151,800	763,900	537,100	226,800

MISSOURI RIVER BASIN STUDY - 1962

Subregion 7

Volume of growing stock and sawtimber on commercial forest land by species and stand-size classes.

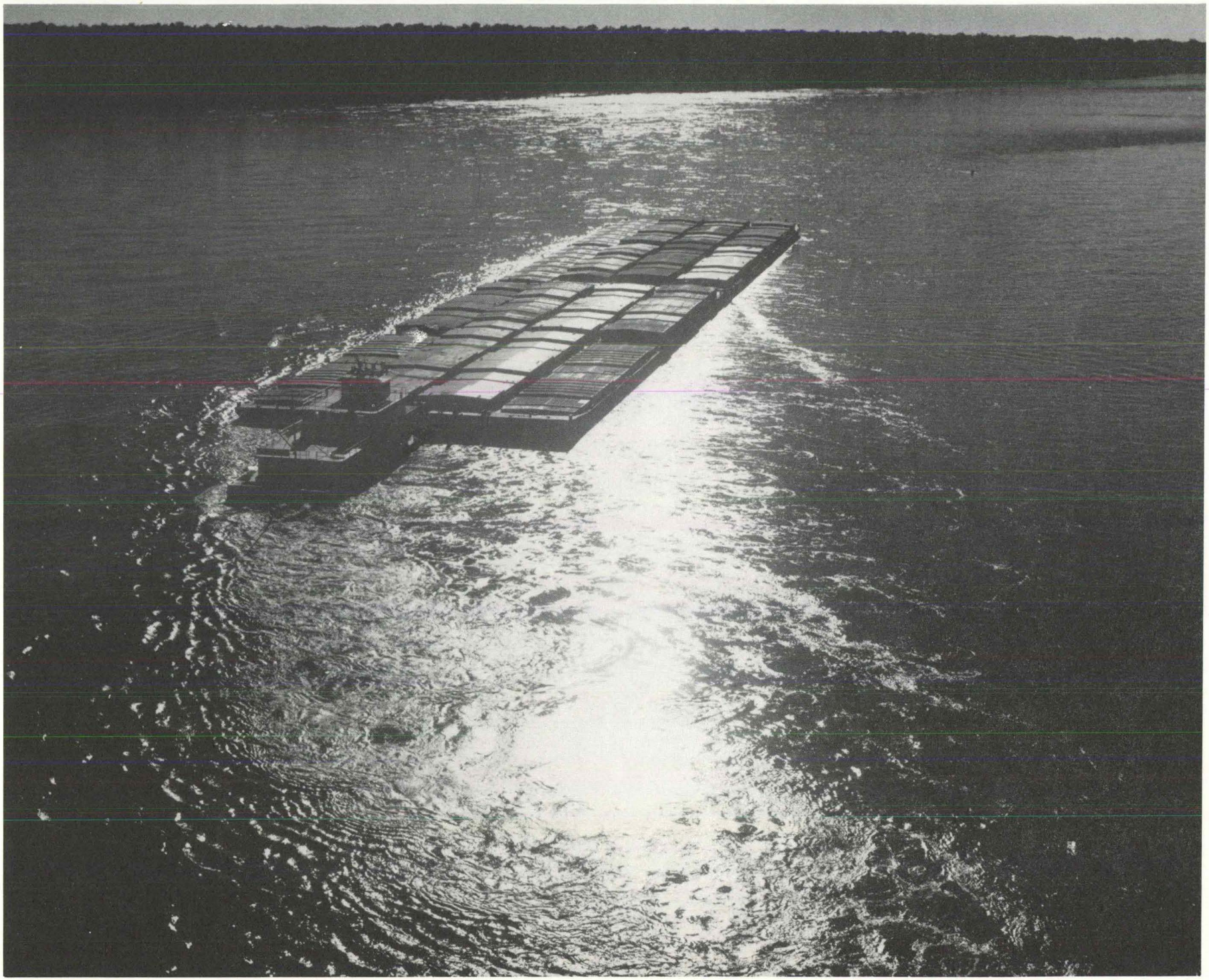
Species	Growing stock			Sawtimber		
	Total	Poletimber	Sawtimber	Total	In sawtimber stands	In other stands
	(M cubic feet)			(M board feet)		
Softwoods:						
Douglas fir						
Ponderosa pine						
True firs						
Spruce						
Lodgepole pine						
Southern pines						
Eastern red cedar	100	100	-	100	100	-
Other Softwoods						
Total Softwoods	100	100	-	100	100	-
Hardwoods:						
Select oaks	30,800	6,600	24,200	117,000	102,400	14,600
Other oaks	7,600	1,400	6,200	29,600	26,000	3,600
Hickory	4,700	2,800	1,900	9,800	7,700	2,100
Ash and Walnut	27,500	9,800	117,700	78,400	62,500	15,900
Cottonwood and Aspen	75,300	12,100	63,200	323,800	307,200	16,600
Other hardwoods	78,100	19,600	58,500	276,000	243,400	32,600
Total hardwoods	224,000	52,300	171,700	834,600	749,200	85,400
Total Subregion	224,100	52,400	171,700	834,700	749,300	85,400

MISSOURI RIVER BASIN STUDY - 1962

Subregion 8

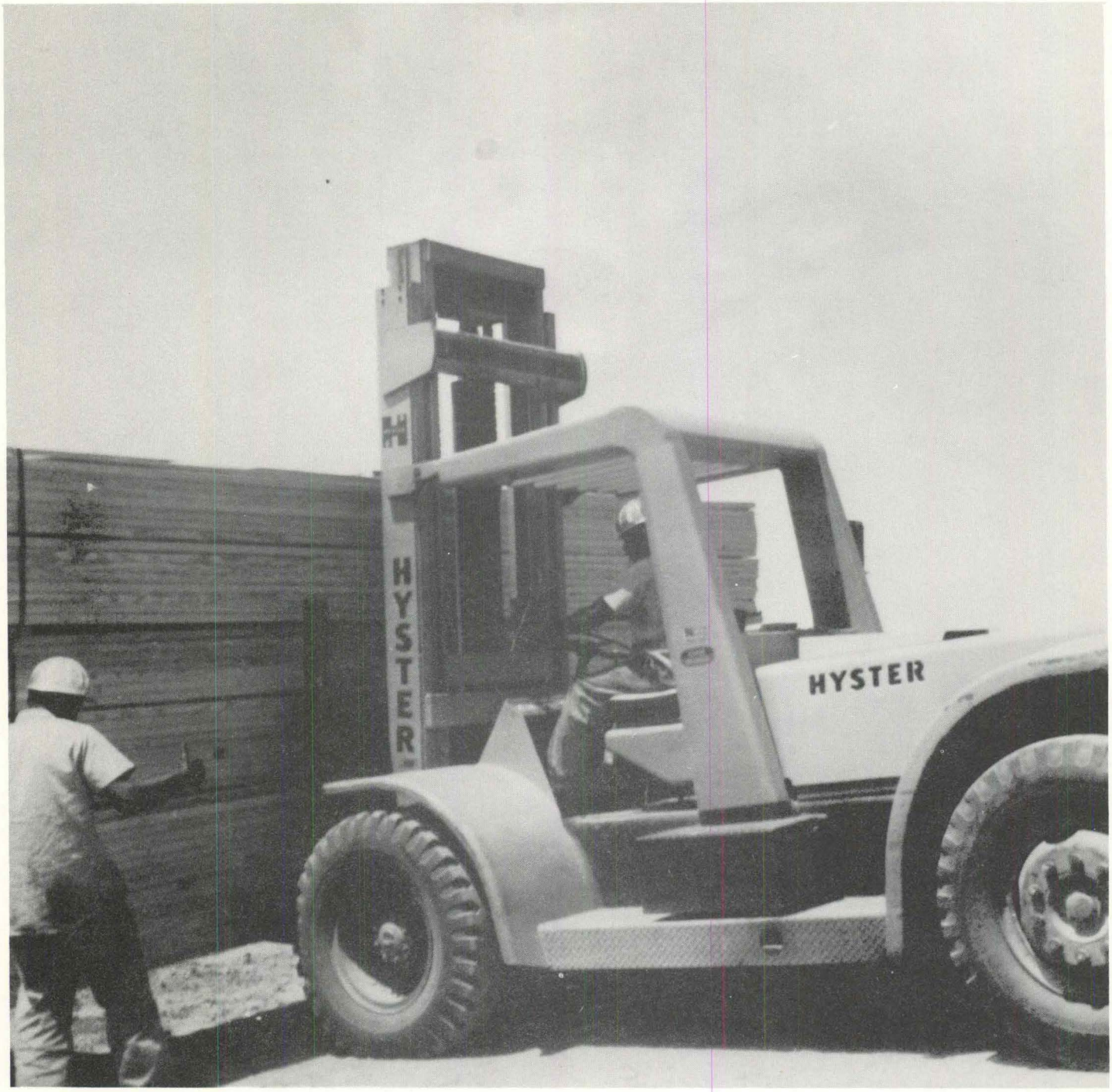
Volume of growing stock and sawtimber on commercial forest land by species and stand-size classes.

Species	Growing stock			Sawtimber		
	Total	Poletimber	Sawtimber	Total	In sawtimber stands	In other stands
	(M cubic feet)			(M board feet)		
Softwoods:						
Douglas fir						
Ponderosa pine						
True firs						
Spruce						
Lodgepole pine						
Southern pines	19,600	9,500	10,100	64,500	20,700	43,800
Eastern red cedar	4,900	4,500	400	1,400	800	600
Other softwoods						
Total softwoods	24,500	14,000	10,500	65,900	21,500	44,400
Hardwoods:						
Select oaks	512,900	229,100	283,800	1,752,000	1,334,700	417,300
Other oaks	652,900	389,000	263,900	1,610,000	967,700	642,300
Hickory	147,600	92,300	55,300	343,400	242,500	100,900
Ash and walnut	118,500	54,800	63,700	359,100	281,100	78,000
Cottonwood and Aspen	35,500	5,400	30,100	158,600	139,700	18,900
Other hardwoods	405,400	163,100	242,300	1,431,100	1,155,400	275,700
Total hardwoods	1,872,800	933,700	939,100	5,654,200	4,121,000	1,533,100
Total Subregion	1,897,300	947,700	949,600	5,720,100	4,142,600	1,577,500



Barging scene on the Mississippi River in Northeast Iowa.

BARGE TERMINAL



Packaged lumber is moved economically the full length of the waterway system through the use of covered barges. Fork lifts such as that shown above, greatly facilitate rapid loading of barges at their point of origin and offloading later.

The central location of Iowa favors the transportation of wood products to and from the state. Iowa is located on the Inland Waterways System which provides low cost transportation to both Eastern and Western regions of Iowa. Electric power is well distributed throughout the state and although the power is furnished by small companies, sufficient quantities of electricity can be provided to any point through the Iowa Grid System. Major pipelines traverse the state from West to East and provide natural gas and other petroleum products to fill any industrial requirements.

TRANSPORTATION

Barging

Traffic on the Mississippi River is a hustling picture of a rapidly expanding industry from New Orleans to Minneapolis. River traffic is increasing yearly and it is estimated that towboats are pushing roughly 10% of the nation's total tonnage. From 1956 to 1965 the latest estimates show that the tonnage shipped on the Mississippi River system has more than doubled to a new high in excess of sixty million ton-miles.

A representative of the Corps of Engineers points out that the cost factors provided river shippers where large tonnage is involved is in accordance with the following chart:

A CHART OF COMPARATIVE TRANSPORTATION COSTS

Type of Shipping	Ton-Mile
Water shipping by barge	3 Mills
Railroad shipping	15 Mills
Trucking	65 Mills
Air Freight	220 Mills

The extensive InLand Waterways System is maintained by the U.S. Corps of Engineers and the availability of barging facilities to the forest industries enable the firms to take advantage of the reduced transportation costs. Water routes are a key link to area growth and the development is directly related to the expansion and improvement of its navigable waterways. The following mileage chart of the Inland Waterways System provides the distances by water to some of the larger industrial cities.

A nine foot channel is presently maintained on the Mississippi River and a similar channel is under construction as far as Sioux City on the Missouri

Harbor Front Industrial Park

River. The nine foot channel permits the use of standard size barges which can carry an average load of logs scaling 100,000 board feet. Barge loads of finished lumber can be delivered to Iowa consumers through the use of covered barges which may carry 500,000 feet or more of packaged material.

The timber industry in this area has failed to use water transportation facilities in comparison to the use made by the chemical and oil industries. Industrial plants located on major rivers in other regions have utilized barging to the fullest and have substantially reduced the cost of transportation.

TRUCKING

Timber products which are being produced in the Iowa woodlots are unusually accessible during dry periods of the year. In so far as the logging is concerned farm trucks and tractors can reach the forested lands with a minimum of effort. Bolts and small logs may be loaded with ease but large timber can be handled more economically by logging crews who have heavier equipment and work on a full time basis.

The distance from the woods operation to the nearest major highway is customarily very short.

Large diesel powered trucks may be used to move logs, chips, or other wood products for long distances at an economical rate on the main highways to plant locations.

Major United States and state highways serve the state of Iowa and the midcontinent region. The New Interstate Highway System provides quick access to the markets for goods produced in the state of Iowa.

The shipping time to principal cities from Iowa is generally as follows for all towns in Iowa.

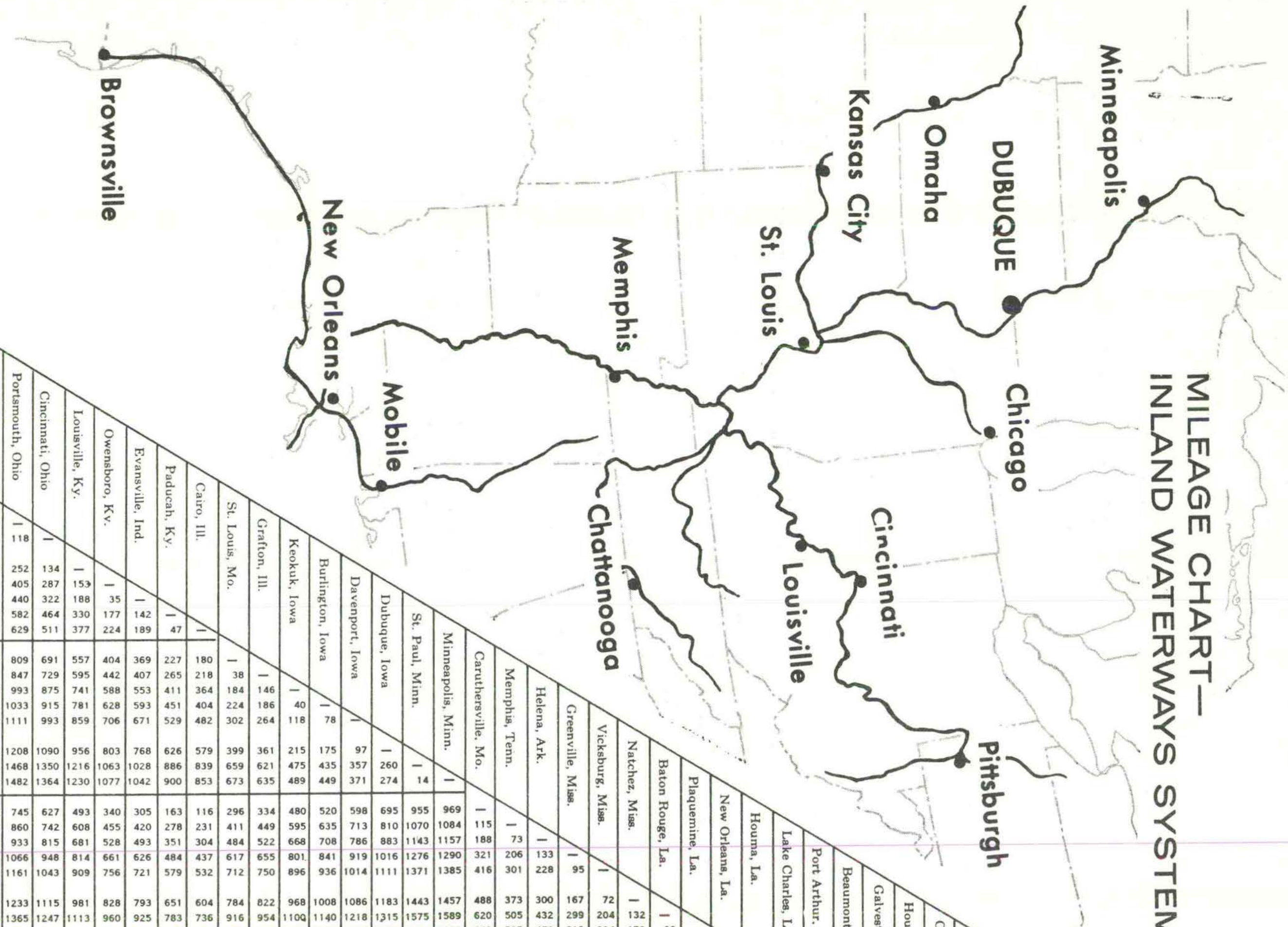
Chicago - overnight	Los Angeles - 3 days
Denver - overnight	New York - 3 days
St. Louis - overnight	Boston - 3 days
Houston - 2 days	Detroit - 2 days

Some common motor carriers and the states services are as follows:

Briggs Transportation Company - Illinois, Indiana, Iowa, Minnesota, Nebraska and Wisconsin.

Consolidated Freightways - Alaska, Arizona, California, Colorado, Connecticut, Maryland, Delaware, Idaho, Illinois, Indiana, Iowa, Kansas, Kentucky, Massachusetts, Michigan, Minnesota, Missouri, Montana, Nebraska, New Jersey, New York, Nevada, North Dakota, Ohio, Oregon, Pennsylvania, Rhode Island, Utah, Washington, Wisconsin, and Wyoming.

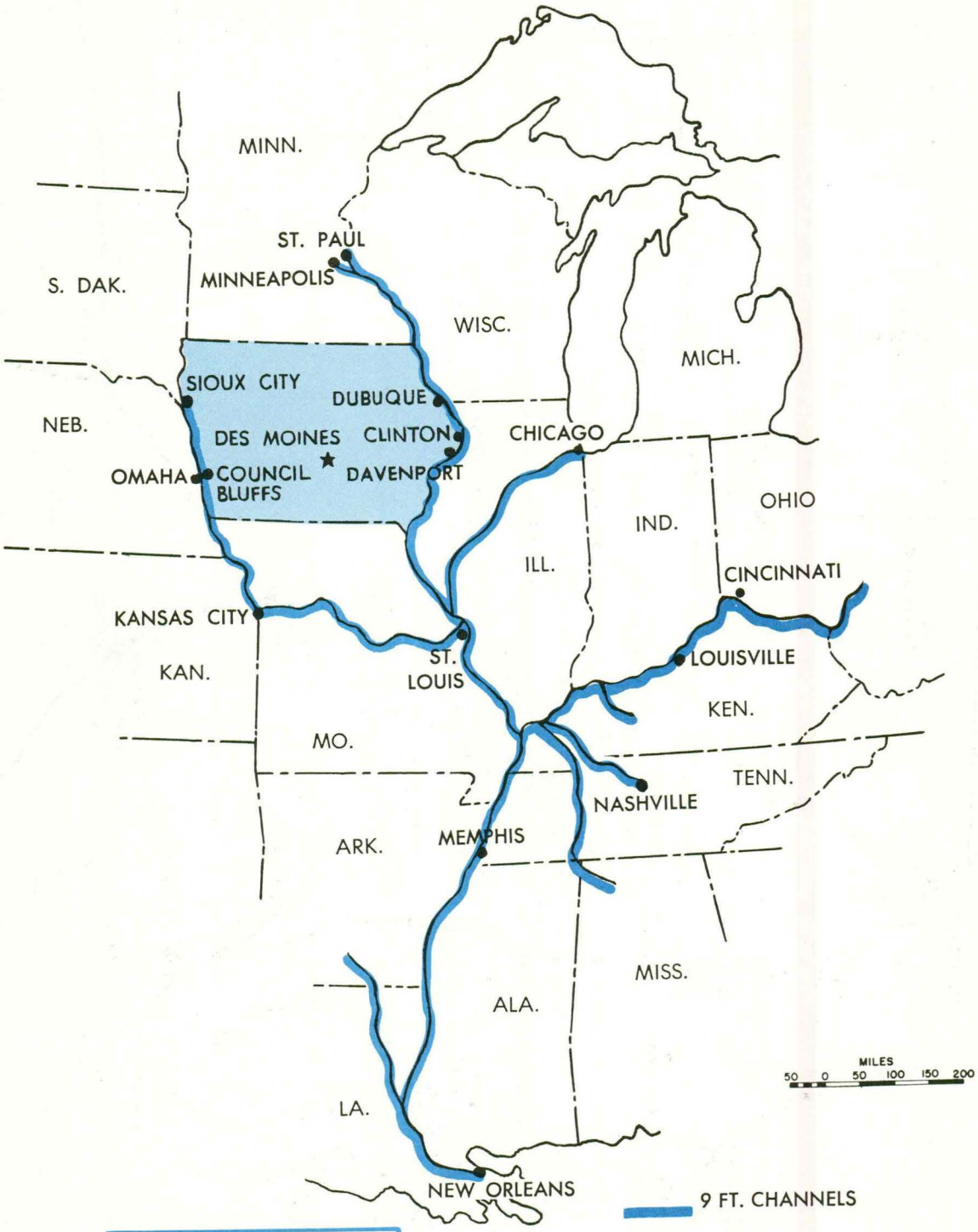
MILEAGE CHART— INLAND WATERWAYS SYSTEM



Section		Pittsburgh, Pa.	East Liverpool, Ohio	Weirton, W. Va.	Steubenville, Ohio	Wheeling, W. Va.	Parkersburg, W. Va.	Pt. Pleasant, W. Va.	Huntington, W. Va.	Portsmouth, Ohio	Cincinnati, Ohio	Louisville, Ky.	Owensboro, Ky.	Evansville, Ind.	Paducah, Ky.	Cairo, Ill.	St. Louis, Mo.	Grafton, Ill.
Ohio River	Pittsburgh, Pa.	—																
	East Liverpool, Ohio	44	—															
	Weirton, W. Va.	62	18	—														
	Steubenville, Ohio	69	25	7	—													
	Wheeling, W. Va.	91	47	29	22	—												
	Parkersburg, W. Va.	185	141	123	116	94	—											
	Pt. Pleasant, W. Va.	265	221	203	196	174	80	—										
	Huntington, W. Va.	308	264	246	239	217	123	43	—									
	Portsmouth, Ohio	352	308	290	283	261	167	87	44	—								
	Cincinnati, Ohio	470	426	408	401	379	285	205	162	118	—							
	Louisville, Ky.	604	560	542	535	513	419	339	296	252	134	—						
	Owensboro, Ky.	757	713	695	688	666	572	492	449	405	287	153	—					
	Evansville, Ind.	792	748	730	723	701	607	527	484	440	322	188	35	—				
	Paducah, Ky.	934	890	872	865	843	749	669	626	582	464	330	177	142	—			
	Cairo, Ill.	981	937	919	912	890	796	716	673	629	511	377	224	189	47	—		
Upper Miss.	St. Louis, Mo.	1161	1117	1099	1092	1070	976	896	853	809	691	557	404	369	227	180	—	
	Grafton, Ill.	1199	1155	1137	1130	1108	1014	934	891	847	729	595	442	407	265	218	38	—
	Keokuk, Iowa	1345	1301	1283	1276	1254	1160	1080	1037	993	875	741	588	553	411	364	184	146
	Burlington, Iowa	1385	1341	1323	1316	1294	1200	1120	1077	1033	915	781	628	593	451	404	224	186
	Davenport, Iowa	1463	1419	1401	1394	1372	1278	1198	1155	1111	993	859	706	671	529	482	302	264
	Dubuque, Iowa	1560	1516	1498	1491	1469	1375	1295	1252	1208	1090	956	803	768	626	579	399	361
	St. Paul, Minn.	1820	1776	1758	1751	1729	1635	1555	1512	1468	1350	1216	1063	1028	886	839	659	621
	Minneapolis, Minn.	1834	1790	1772	1765	1743	1649	1569	1526	1482	1364	1230	1077	1042	900	853	673	635
Lower Miss.	Caruthersville, Mo.	1097	1053	1035	1028	1006	912	832	789	745	627	493	340	305	163	116	296	334
	Memphis, Tenn.	1212	1168	1150	1143	1121	1027	947	904	860	742	608	455	420	278	231	411	449
	Helena, Ark.	1285	1241	1223	1216	1194	1100	1020	977	933	815	681	528	493	351	304	484	522
	Greenville, Miss.	1418	1374	1356	1349	1327	1233	1153	1110	1066	948	814	661	626	484	437	617	655
	Vicksburg, Miss.	1513	1469	1451	1444	1422	1328	1248	1205	1161	1043	909	756	721	579	532	712	750
	Natchez, Miss.	1585	1541	1523	1516	1494	1400	1320	1277	1233	1115	981	828	793	651	604	784	822
	Baton Rouge, La.	1717	1673	1655	1648	1626	1532	1452	1409	1365	1247	1113	960	925	783	736	916	954
	Plaquemine, La.	1737	1693	1675	1668	1646	1552	1472	1429	1385	1267	1133	980	945	803	756	936	974
	New Orleans, La.	1850	1806	1788	1781	1759	1665	1585	1542	1498	1380	1246	1093	1058	916	869	1049	1087
Canal	Houma, La.	1914	1870	1852	1845	1823	1729	1649	1606	1562	1444	1310	1157	1122	980	933	1113	1151
	Lake Charles, La.	2107	2063	2045	2038	2016	1922	1842	1799	1755	1637	1503	1350	1315	1173	1126	1306	1344
	Port Arthur, Tex.	2139	2095	2077	2070	2048	1954	1874	1831	1787	1668	1535	1382	1347	1205	1158	1338	1376
	Beaumont, Tex.	2149	2105	2087	2080	2058	1964	1884	1841	1797	1679	1545	1392	1357	1215	1168	1348	1386
	Galveston, Tex.	2207	2163	2145	2138	2116	2022	1942	1899	1855	1737	1603	1450	1415	1273	1226	1406	1444
	Houston, Tex.	2260	2216	2198	2191	2169	2075	1995	1952	1908	1790	1656	1503	1468	1326	1279	1459	1497
	Corpus Christi, Tex.	2412	2368	2350	2343	2321	2227	2147	2104	2060	1942	1808	1655	1620	1478	1431	1611	1649
	Brownsville, Tex.	2547	2503	2485	2478	2456	2362	2282	2239	2195	2077	1943	1790	1755	1613	1566	1746	1784
Misc. River	McKeesport, Pa.	15	59	77	84	106	200	280	323	367	485	619	772	807	949	996	1176	1214
	Morgantown, W. Va.	101	145	163	170	192	286	366	409	453	571	705	858	893	1035	1082	1262	1300
	Fairmont, W. Va.	127	171	189	196	218	312	392	435	479	597	731	884	919	1061	1108	1288	1326
	Brackenridge, Pa.	23	67	85	92	114	208	288	331	375	493	627	780	815	957	1004	1184	1222
	Charleston, W. Va.	323	279	261	254	232	138	58	101	145	263	397	550	585	727	774	954	992
	Nashville, Tenn.	1110	1066	1048	1041	1019	925	845	802	758	640	506	353	318	202	249	429	467
	Chattanooga, Tenn.	1398	1354	1336	1329	1307	1213	1133	1090	1046	928	794	641	606	464	511	691	729
	Knoxville, Tenn.	1582	1538	1520	1513	1491	1397	1317	1274	1230	1112	978	825	790	648	695	875	913
	Peoria, Ill.	1362	1318	1300	1293	1271	1177	1097	1054	1010	892	758	605	570	428	381	201	163
	Chicago, Ill.	1526	1482	1464	1457	1435	1341	1261	1218	1174	1056	922	769	734	592	545	365	327
	Kansas City, Mo.	1553	1509	1491	1484	1462	1368	1288	1245	1201	1083	949	796	761	619	572	392	400

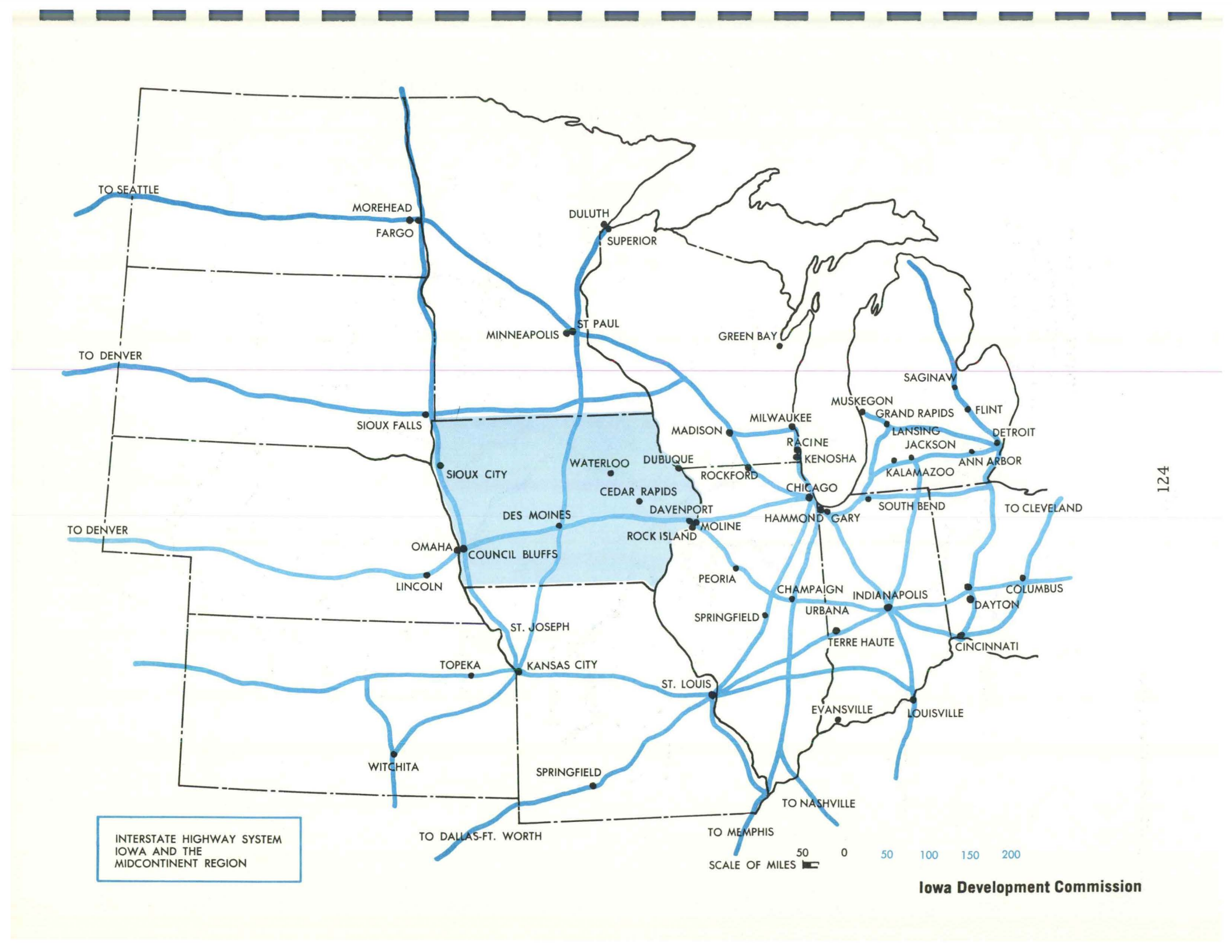
	Keokuk, Iowa	Burlington, Iowa	Davenport, Iowa	Dubuque, Iowa	St. Paul, Minn.	Minneapolis, Minn.	Caruthersville, Mo.	Memphis, Tenn.	Helena, Ark.	Greenville, Miss.	Vicksburg, Miss.	Natchez, Miss.	Baton Rouge, La.	Plaquemine, La.	New Orleans, La.	Houma, La.	Lake Charles, La.
Keokuk, Iowa	—																
Burlington, Iowa	40	—															
Davenport, Iowa	118	78	—														
Dubuque, Iowa	215	175	97	—													
St. Paul, Minn.	475	435	357	260	—												
Minneapolis, Minn.	489	449	371	274	14	—											
Caruthersville, Mo.	480	520	598	695	955	969	—										
Memphis, Tenn.	595	635	713	810	1070	1084	115	—									
Helena, Ark.	668	708	786	883	1143	1157	188	73	—								
Greenville, Miss.	801	841	919	1016	1276	1290	321	206	133	—							
Vicksburg, Miss.	896	936	1014	1111	1371	1385	416	301	228	95	—						
Natchez, Miss.	968	1008	1086	1183	1443	1457	488	373	300	167	72	—					
Baton Rouge, La.	1100	1140	1218	1315	1575	1589	620	505	432	299	204	132	—				
Plaquemine, La.	1120	1160	1238	1335	1595	1609	640	525	452	319	224	152	20	—			
New Orleans, La.	1233	1273	1351	1448	1708	1722	753	638	565	432	337	265	133	113	—		
Houma, La.	1297	1337	1415	1512	1772	1786	817	702	629	496	401	329	197	177	64	—	
Lake Charles, La.	1490	1530	1608	1705	1965	1979	1010	895	822	689	594	522	390	370	257	193	—
Port Arthur, Tex.	1522	1562	1640	1737	1997	2011	1042	927	854	721	626	554	422	402	289	225	32
Beaumont, Tex.	1532	1572	1650	1747	2007	2021	1052	937	864	731	636	564	432	412	299	235	42
Galveston, Tex.	1590	1630	1708	1805	2065	2079	1110	995	922	789	694	622	490	470	357	293	100
Houston, Tex.	1643	1683	1761	1858	2118	2132	1163	1048	975	842	747	675	543	523	410	346	153
Corpus Christi, Tex.	1795	1835	1913	2010	2270	2284	1315	1200	1127	994	899	827	695	675	562	498	305
Brownsville, Tex.	1930	1970	2048	2145	2405	2419	1450	1335	1262	1129	1034	962	830	810	697	633	440
McKeesport, Pa.	1360	1400	1478	1575	1835	1849	1112	1227	1300	1433	1528	1600	1732	1752	1865	1929	2122
Morgantown, W. Va.	1446	1486	1564	1661	1921	1935	1198	1313	1386	1519	1614	1686	1818	1836	1949	2013	2206
Fairmont, W. Va.	1472	1512	1590	1687	1947	1961	1224	1339	1412	1545	1640	1712	1844	1864	1977	2041	2234
Brackenridge, Pa.	1368	1408	1486	1583	1843	1857	1120	1235	1308	1441	1536	1608	1740	1760	1873	1937	2130
Charleston, W. Va.	1138	1178	1256	1353	1613	1627	890	1005	1078	1211	1306	1378	1510	1530	1643	1707	1900
Nashville, Tenn.	613	653	731	828	1088	1102	365	480	553	686	781	853	985	1005	1118	1182	1375
Chattanooga, Tenn.	875	915	993	1090	1350	1364	627	742	815	948	1043	1115	1247	1267	1380	1444	1637
Knoxville, Tenn.	1059	1099	1177	1274	1534	1548	811	926	999	1132	1227	1299	1431	1451	1564	1628	1821
Peoria, Ill.	309	349	427	524	784	798	497	612	685	818	913	985	1117	1137	1250	1314	1507
Chicago, Ill.	473	513	591	688	948	962	661	774	847	980	1075	1147	1279	1299	1412	1476	1669
Kansas City, Mo.	546	586	664	761	1021	1035	688	803	876	1009	1104	1176	1308	1328	1441	1503	1698

	Port Arthur, Tex.	Beaumont, Tex.	Galveston, Tex.	Houston, Tex.	Corpus Christi, Tex.	Brownsville, Tex.	McKeesport, Pa.	Morgantown, W. Va	Fairmont, W. Va.	Brackenridge, Pa.	Charleston W. Va.	Nashville Tenn.	Chattanooga, Tenn.	Knoxville, Tenn.	Peoria, Ill.	Chicago, Ill.
Port Arthur, Tex.	—															
Beaumont, Tex.	10	—														
Galveston, Tex.	68	58	—													
Houston, Tex.	121	111	53	—												
Corpus Christi, Tex.	273	263	205	152	—											
Brownsville, Tex.	408	398	340	287	135	—										
McKeesport, Pa.	2154	2164	2222	2275	2427	2562	—									
Morgantown, W. Va.	2238	2248	2306	2359	2511	2646	86	—								
Fairmont, W. Va.	2266	2276	2334	2387	2539	2674	112	26	—							
Brackenridge, Pa.	2162	2172	2230	2283	2435	2570	38	124	150	—						
Charleston, W. Va.	1932	1942	2000	2053	2205	2340	338	424	450	346	—					
Nashville, Tenn.	1407	1417	1475	1528	1670	1805	1125	1211	1237	1133	903	—				
Chattanooga, Tenn.	1669	1679	1737	1790	1942	2077	1413	1499	1525	1421	1191	666	—			
Knoxville, Tenn.	1853	1863	1921	1974	2126	2261	1597	1683	1709	1605	1375	850	184	—		
Peoria, Ill.	1539	1549	1607	1660	1812	1947	1377	1463	1489	1385	1155	630	892	1076	—	
Chicago, Ill.	1701	1711	1769	1822	1974	2109	1541	1627	1653	1549	1319	794	1056	1240	164	—
Kansas City, Mo.	1730	1740	1798	1851	2003	2138	1568	1654	1680	1576	1346	821	1083	1267	563	727



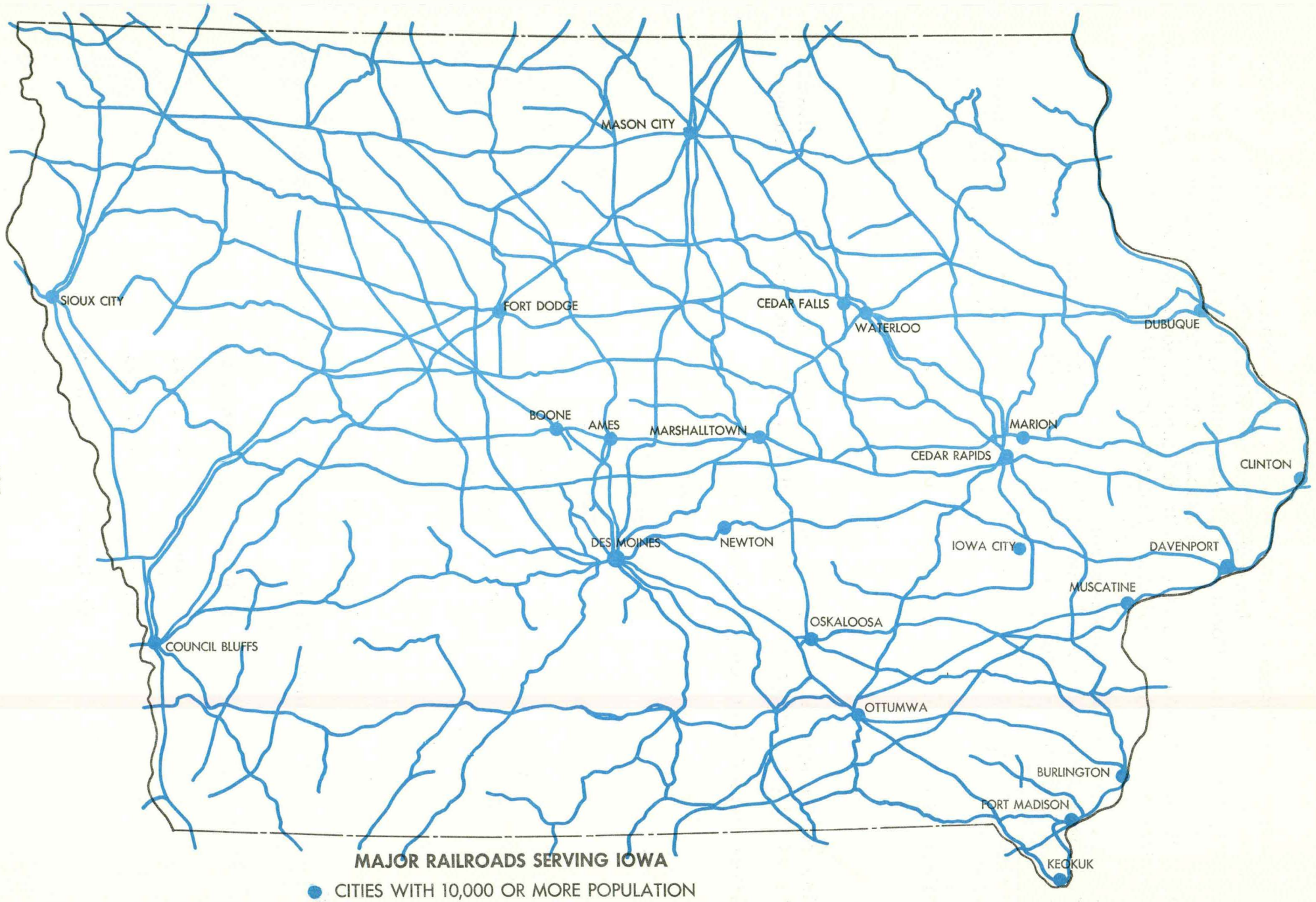
INLAND WATERWAYS CONNECTING IOWA WITH MAJOR MARKETS AND RAW MATERIAL SOURCES

Iowa Development Commission



INTERSTATE HIGHWAY SYSTEM
IOWA AND THE
MIDCONTINENT REGION

Iowa Development Commission



MAJOR RAILROADS SERVING IOWA

● CITIES WITH 10,000 OR MORE POPULATION

Iowa Development Commission

Dohrn Transfer Company - Illinois, Indiana, Iowa, Kentucky, Michigan, Minnesota, Missouri, Ohio and Wisconsin.
Gateway Transportation Company - Illinois, Indiana, Iowa, Michigan, Minnesota, Missouri, Ohio, Pennsylvania, and Wisconsin.
*H & W Motor Express Company - Illinois, Indiana, Iowa, Minnesota, and Wisconsin.
Keeshin Transport System - Illinois, Indiana, Iowa, Michigan, New York, Ohio and Wisconsin.
L & N Transfer - Iowa and Wisconsin.
*Leytem Trucking Company - Iowa, Minnesota and Wisconsin.
Robertson Transfer - Illinois, Indiana, Iowa, Minnesota, and Missouri.
*J. M. Sweeney - Illinois, Iowa and Wisconsin.
*Walser Moving & Storage Company - Minnesota, Wisconsin and Illinois, Iowa, Missouri, Kansas and Indiana.

*Home office located in Dubuque, Iowa.

RAILROADS

The railroad systems making an extensive coverage of the entire state is illustrated by the following map on which cities with 10,000 or more population are shown.

Major railroads that serve Iowa are as follows:

Burlington Roads

Union Pacific

The Milwaukee Road

Illinois Central

Northwestern

Norfolk and Western

The Great Western

Rock Island

An example of the shipping time to principal cities from Iowa on a carload basis is as follows:

Chicago	- 18 hours
Memphis	- 2 days
Denver	- 2 days
St. Louis	- 16 hours

Houston	- 3 days
Los Angeles	- 4 days
New York	- 5 days
Boston	- 6 days
Detroit	- 2 days

In 1967 the Chicago, Rock Island and Pacific Railroad company in Iowa forwarded approximately 1,236 carloads of lumber and forest products and received approximately 4,171 carloads. This one railroad estimated that over 800 cars of forwarded shipments consisted of millwork (sash, doors, & etc.) with the balance consisting of walnut and other native logs, sawdust and other wood products. 1/

The Milwaukee Railroad has furnished a chart consisting of state to state commodity flow analysis titled "Summary of Lumber of Wood Products Flow for the state of Iowa - Year 1966". Carloads of lumber and forest products originating outside of the state of Iowa total 5,519 carloads. Only 126 carloads originating in the state of Iowa, terminated within the state boundaries. In addition to these carloads of wood products, 1,998 carloads were shipped out of the state. Detailed description of finished material and raw products are indicated on the following chart.

LABOR

There is little need for unskilled laborers at this time as industry has made the transition from the use of numerous hand laborers to the use of semi-skilled and skilled employees who are qualified to use electrically operated machinery.

Iowa is one of the states in which the "Right-to-Work" laws have been legalized and loss of time, or industrial strikes are of minimum consideration throughout the entire state. Iowa's "Right-to-Work" law has been on the books since 1947.

Living conditions are exceptionally favorable in this state as recreational and other facilities are worked out for the employees by the major industries or cities in which industries have been concentrated.

There is strenuous competition for employees between the large agricultural fields and the ever increasingly large industrial industries. Forestry, the production of forest products, and related industries are able to siphon only a very small proportion of the total amount of labor available.

Workers do have a better education than the workers of other states and are more fully equipped to meet today's need for mechanically adapted skilled labor.

1/ Chicago, Rock Island and Pacific Railroad Company, R. W. Morrison, Industrial Development and Real Estate Sales.

SUMMARY OF LUMBER OR WOOD PRODUCTS FLOW FOR STATE OF IOWA -- YEAR 1966

STCC	Description	Originate Outside of Iowa		Terminate Outside of Iowa		Originate & Term. in Iowa	
		Cars	CWT	Cars	CWT	Cars	CWT
2 41 11	Sawlogs	42	28430	472	316837	70	39546
2 41 12	Hewn R.R. or Mine Ties	-	-	2	1483	-	-
2 41 14	Pulpwood Logs	167	149831	21	21000	15	13135
2 41 15	Pulpwood or other Wood Chips	1	486	-	-	2	1011
2 41 16	Wood Posts, Poles or Piling	25	14228	-	-	-	-
2 42 11	Lumber, Rough or Dressed	3637	2749183	61	49961	5	3417
2 42 12	Sawed Ties (R.R., Mine, Etc.)	5	2788	118	99077	-	-
2 42 14	Hardwood Dimension Stock	23	11229	23	3924	-	-
2 42 15	Hardwood Flooring	9	4716	-	-	-	-
2 42 19	Lumber or Dimension Stock	-	-	18	13598	-	-
2 42 91	Shingles	39	21153	-	-	-	-
2 42 92	Cooperage Stock	-	-	17	16860	-	-
2 42 93	Shavings or Sawdust	64	28275	534	261875	6	2492
2 42 94	Excelsior, Baled or Bulk	21	5049	-	-	-	-
2 42 99	Sawmill or Planing Mill Products	1	620	-	-	-	-
2 43 12	Window Sash, Wood	6	2078	148	51747	11	3740
2 43 13	Window or Door Frames or Jams, Wood	8	3599	224	78592	1	340
2 43 14	Doors or Shutters, Wood	67	23697	253	90333	14	4322
2 43 16	Wood Mouldings	56	33746	5	1700	-	-
2 43 19	Millwork, Nec.	21	9434	51	16010	-	-
2 43 21	Plywood or Veneer	739	588949	5	3612	1	733
2 43 31	Wooden Fab. Structural Framing	1	344	-	-	-	-
2 43 32	Prefabricated Buildings, Wood	7	1460	-	-	-	-
2 44 11	Boxes, Cases, Crater or Carriers	2	971	2	680	-	-

Source: (Milwaukee Road - State to State Commodity Flow Analysis)

SUMMARY OF LUMBER OR WOOD PRODUCTS FLOW FOR STATE OF IOWA -- YEAR 1966 (Continued)

STCC	Description	Originate Outside of Iowa		Terminate Outside of Iowa		Originate & Term. in Iowa	
		Cars	CWT	Cars	CWT	Cars	CWT
2 44 13	Fruit or Vegetable Baskets or Hampers	2	450	-	-	-	-
2 44 14	Baskets or Hampers	-	-	9	1044	-	-
2 44 15	Cooperage	-	-	1	257	-	-
2 49 11	Wooden Piling, Creosote or Oil Treated	324	189672	-	-	-	-
2 49 12	Ties Creosoted or Oil Treated, Mine	17	10300	-	-	-	-
2 49 51	Hand Tool Handles	3	1973	-	-	-	-
2 49 71	Wooden Ware	-	-	1	500	-	-
2 49 92	Skids, Pallets, or Platforms	16	6356	28	6612	-	-
2 49 93	Wood Particle Board or Hardboard	119	87638	0	0	1	540
2 49 95	Pipe, Conduit, or Fittings, Wooden	-	-	1	400	-	-
2 49 97	Fencing or Gates, Wooden	3	1332	-	-	-	-
2 49 98	Wood Reels or Spools	-	-	4	1200	-	-
2 49 99	Wood Products, Nec.	27	14422	-	-	-	-
2 44 19	Wooden Containers, Nec.	67	19113	-	-	-	-
	Total	5519	4011522	1998	1037302	126	69276
	Tons (CWT/20)		200576		51365		3464
	Total Carloads		7643				
	Total Cut		5118100				
	Total Tonnage		255405				

Source: (Milwaukee Rd. - State to State Commodity Flow Analysis)

Throughout the entire state of Iowa, sixteen area Vocational-Technical Schools have been or are being set up to provide for vocational careers in the various fields of employment. This additional training and the adaptability of skilled employees in this area will enable members of forest industry to secure satisfactory production as a result of the employees labor.

The manpower which formerly was needed to operate the Iowa farms has now been replaced by the use of tractors and other mechanical equipment and sons and daughters have moved into industrial centers and into other states seeking satisfactory employment.

The state of California has attracted many of the working class of people of whom most have a high school, junior college, or university education. Other industrial centers such as the city of Denver, Colorado, Chicago, Illinois, and local industrial centers such as Sioux City and Council Bluffs, Iowa are furnishing employment to the young men and women from the Iowa farms.

A chart indicating the location of the sixteen area vocational schools is provided.

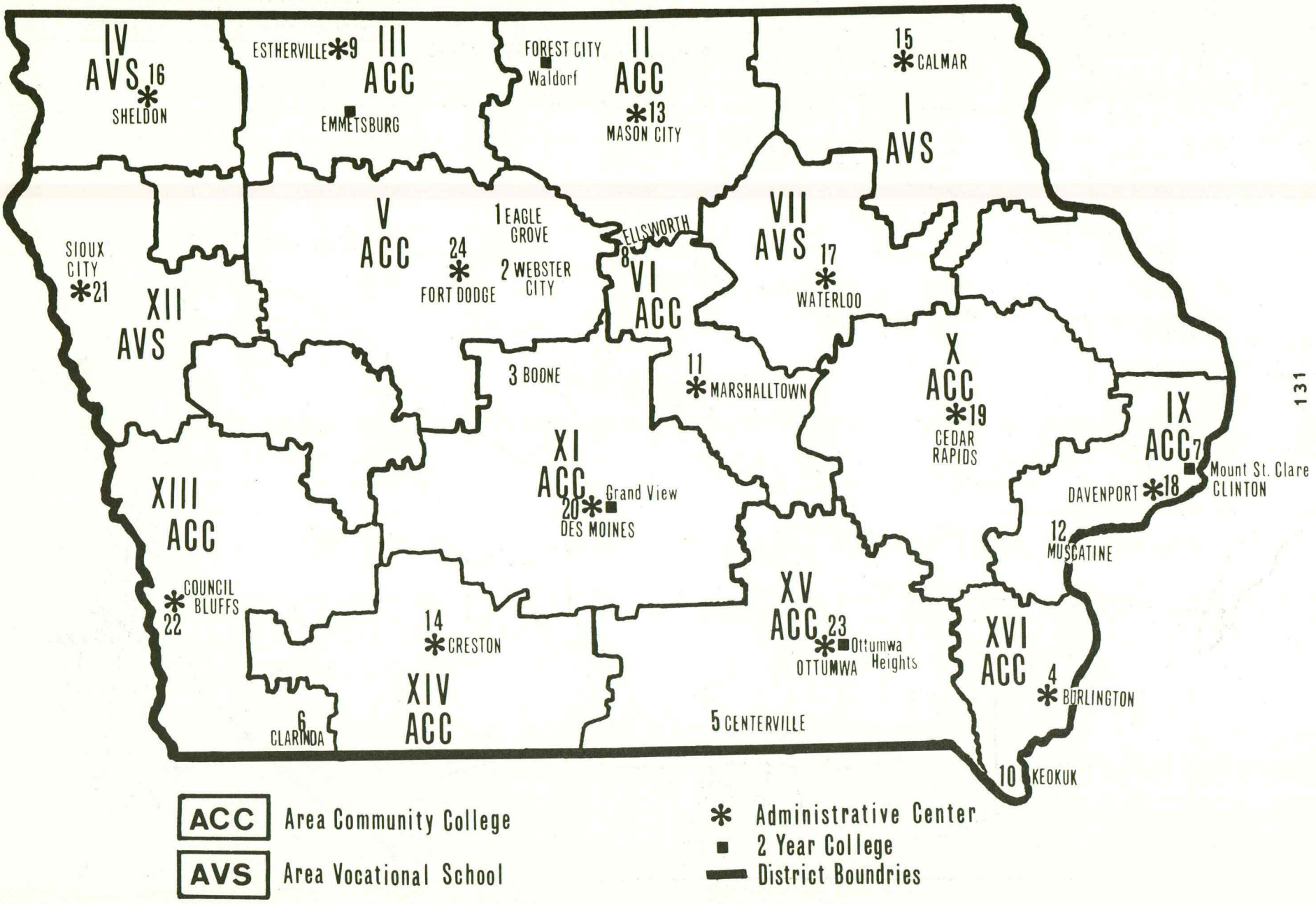
Post high school education is highly developed throughout the state including the educational facilities provided by Iowa's sixteen public junior colleges. Transfer students from junior colleges are encouraged to continue further education by such programs as inaugerated at Iowa State a year ago in the form of "recognition awards". Transfers to ISU having a junior college grade point average of 3.60 receive a certificate of award and a $100 grant. Persons not directly involved in the manufacturing activity also needed by industry include typists and secretaries, technically trained persons, and salesmen.

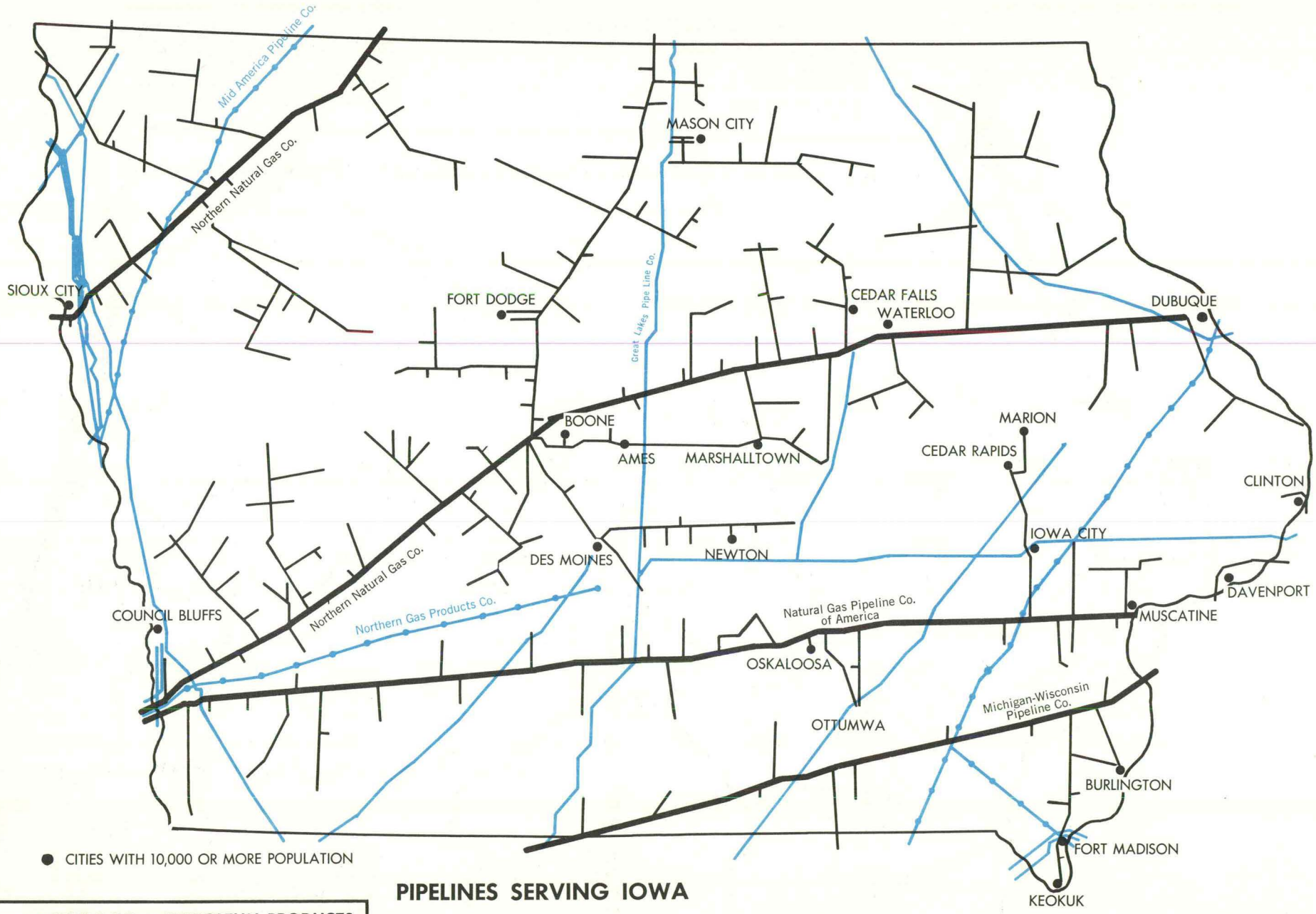
In addition to the benefits commonly derived through higher education in this area, employees raised on the farms have had benefit of practical mechanical training due to the fact that the mid-west region was the first area in which mechanized farming was adapted.

The wage scale for production workers in this mid-west area is comparatively high and justifably in line with the ability of the individual employees. Fringe benefits include group life insurance, medical and surgical benefits, paid vacations, overtime pay and pay for holidays and jury duty.

FUEL

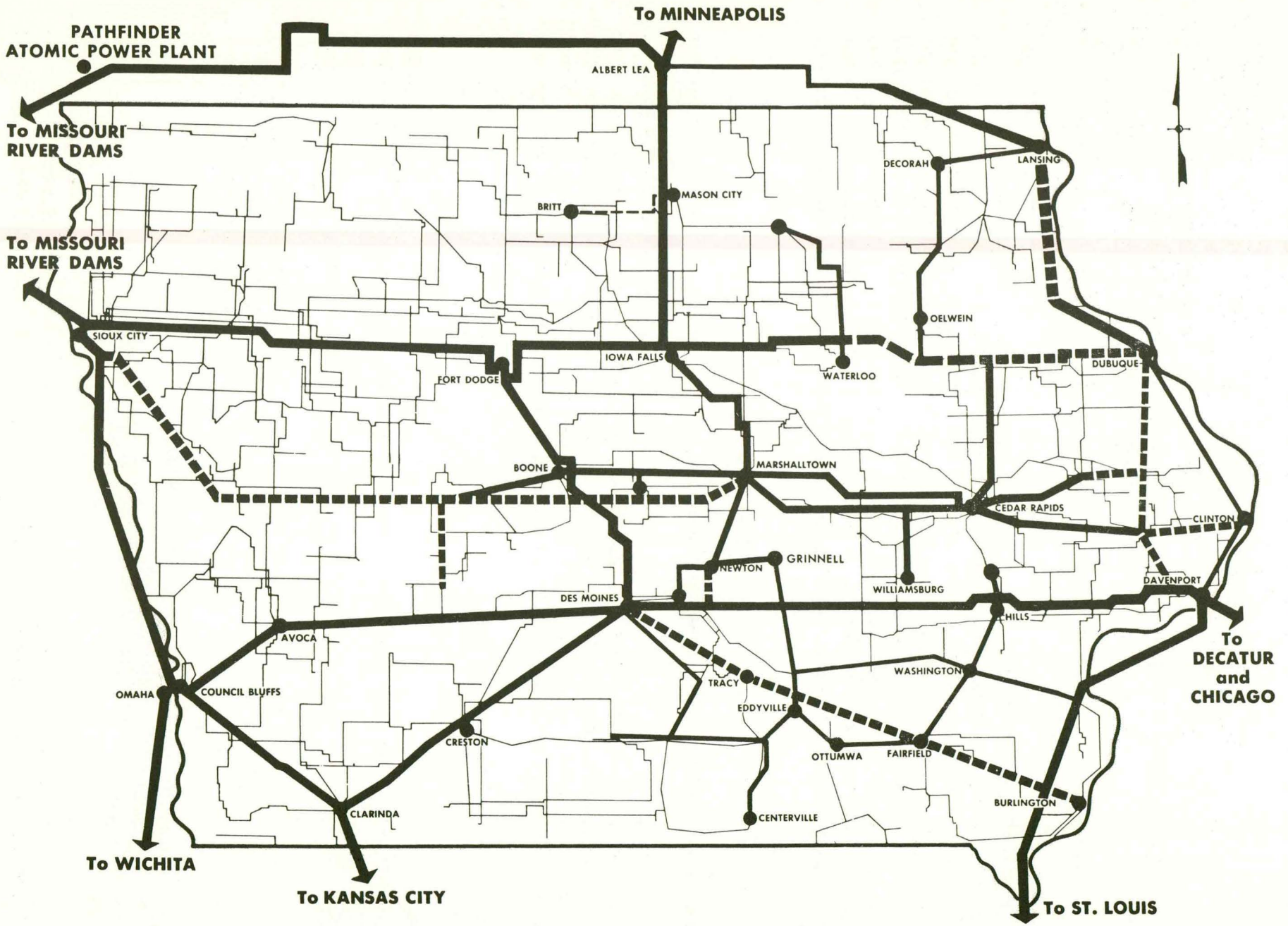
Pipeline facilities providing natural gas and petroleum products are to be found throughout the state of Iowa and are available on any industrial site selected for a wood products plant. Natural gas and fuel is supplied to the state by the Northern Natural Gas Company, The Natural Gas Pipeline Company of America, The Great Lakes Pipeline Company and the Michigan -Wisconsin Pipeline Company.


IV
AVS 16
SHELDON
ESTHERVILLE 9
III
ACC
EMMETSBURG
FOREST CITY
Waldorf
II
ACC
13
MASON CITY
15
CALMAR
I
AVS
V
ACC
1 EAGLE GROVE
24
2 WEBSTER CITY
FORT DODGE
ELLSWORTH
8
VI
ACC
VII
AVS
17
WATERLOO
SIOUX CITY
21
XII
AVS
3 BOONE
11
MARSHALLTOWN
X
ACC
19
CEDAR RAPIDS
IX
ACC 7
Mount St. Clare
CLINTON
DAVENPORT 18
XI
ACC
20
Grand View
DES MOINES
12
MUSCATINE
XIII
ACC
COUNCIL BLUFFS
22
14
CRESTON
XV
ACC 23
Ottumwa Heights
OTTUMWA
XVI
ACC
4
BURLINGTON
XIV
ACC
6
CLARINDA
5 CENTERVILLE
10 KEOKUK
131
ACC Area Community College
AVS Area Vocational School
Administrative Center
2 Year College
District Boundries



PIPELINES SERVING IOWA

Iowa Development Commission



PLANNED ADDITIONS

IOWA'S ELECTRIC GRID SYSTEM

Iowa Development Commission

The Keokuk Gas Service Company purchases gas from the Michigan-Wisconsin Pipeline Company by yearly contract and provides fuel to industry at the following rates:

Keokuk Gas Service Company

Industrial Service

First 1,000 MCF @	$.51 per MCF
Next 1,000 MCF @	.49 per MCF
All Additional @	.46 per MCF

Minimum monthly charge - $150.00

The following chart indicates the distribution of the major pipelines serving the state:

POWER

The electric power plants are comparatively small individually, but the pooling of power under the Iowa Grid System enables the utility companies to interchange bulk power in large quantities. Each utility company can increase plant capacity on a most economical basis and furnish power to industrial plants which may elect to build in any portion of the state.

The following chart of Iowa's present and planned Electric Grid System is provided:

FOREST INDUSTRY FOR THE STATE OF IOWA

The most desirable industries would be those that can make use of wood fiber for which at the present time there is little demand and the landowners have no market for this material. An overall cutting of each of the forest stands in line with practical timber stand improvement measures would yield a supply of material in sufficient quantities to justify the construction of plant facilities based upon a long range program of operation. It is anticipated that the annual increase in volume of timber over the reduction through harvesting action will continue to increase over a period of several years, therefore there will be no depletion of the volumes of timber found as of this date.

Forest products industry in the state of Iowa has the following advantages:

1. Central location to nationwide markets.
2. An intelligent, industrious, and conscientious labor force.
3. Good transportation facilities.
    a. barging
    b. rail
    c. truck
4. Power and fuel supply.
5. A local market for its products.

In addition to wood using markets in the northern and central regions, forest products may be shipped by rail to the northeastern markets or to major ports for shipment to the foreign markets.

Established processing plants in Iowa make use of the factors governing and contributing to make several regions good plant locations. Transportation to the state and the plant site is reasonable enough to permit the shipping of materials from great distances. Products may be used within the state or shipped to the relatively close northern and eastern markets.

MARKETING

The increasing population guarantees to industry a market for their respective products provided the nature of the product is in common use. This increase in population and the popularity of solid wood furniture, as well as paneling, hardwood floors and ever increasing packaging and crating demands will continue to rise.

Recent developments include a new process for non-woven fabrics to be manufactured through the use of textile fibers in connection with wood cellulose pulp. The fabrics are planned to be marketed for use as disposable hospital supplies including disposable sheets, pillow cases, table cloths, napkins to surgical masks and gowns, uniforms and laboratory coats. The manufacturing process consists of the bonding of rayon, acetate, fiber and reinforced paper laid intermittently and the finished product looks like some rayon or cotton products. There is presently being marketed dresses, skirts, net curtains, lingerie and warp knitting and other family lines to come including workman's overalls.

Metal and other substitutes for furniture made of wood are being viewed with increasing disfavor and more and more use is made of the various species of wood products in our homes and offices. The use of oak has regained its pioneer day status and the value of pecan logs is nearing the value paid for black walnut material. Recently persimmon veneer logs have been in great demand and it is predicted here that greater use will be made of the hickory species.

In order to provide the volume of timber products needed to meet the anticipated demands, technological improvements in production and marketing will be necessary. Timber inventories in the United States are sufficient to supply our needs through the year 2000 but if the demand continues to increase as anticipated, forest products will become most difficult to supply. The timber demands must be met by more intensive forest management and utilization so that private owners must intensify the management of their woodlots to provide for greater per acre yield.

Nationwide construction of commercial buildings and houses registered new highs in January 1968. Residentials, including apartments, motels and dormitories climbed 44% over a year ago, with apartments more than doubling. Single family homes were up 26% for the month of January. Half again as many new housing units were reported in 1968 as compared with 1967. Commercial building, stores

Summary of consumption, net imports, and domestic production of timber products in the United States, 1952-2000

Product		1952	1962	Projection 1970	1980	1990	2000
Lumber:							
Consumption	(million board feet)[1]	41,460	37,300	39,700	43,400	48,000	53,500
Net imports		1,752	4,130	5,100	5,800	6,500	7,000
Domestic production		39,708	34,170	34,600	37,600	41,500	46,500
Domestic roundwood[2]		39,480	34,105	35,600	38,600	42,500	47,500
Veneer logs:							
Consumption	(million board feet)[1]	3,082	6,776	10,300	12,500	15,300	18,300
Net imports[3]		148	860	1,300	1,900	2,600	3,400
Domestic production		2,934	5,916	9,000	10,600	12,700	14,900
Domestic roundwood		2,934	5,916	9,000	10,600	12,700	14,900
Pulpwood:							
Consumption[4]	(million std. cds.)	35.4	52.9	67.5	88.5	111.0	141.5
Net imports		11.0	10.1	11.0	11.5	13.0	16.0
Domestic production		25.1	42.8	56.5	77.0	98.0	125.5
Domestic roundwood		23.5	33.8	42.0	60.0	79.0	105.5
Miscellaneous industrial wood:							
Consumption	(million cubic feet)	758	505	500	500	500	500
Net imports		(5)	(5)				
Domestic production		758	505	500	500	500	500
Domestic roundwood		699	465	460	460	460	460
Fuelwood:							
Consumption[6]	(million std. cds.)	58.6	26.9	22.0	18.0	15.0	12.0
Net imports		(5)	(5)				
Domestic production		58.6	26.9	22.0	18.0	15.0	12.0
Domestic roundwood		27.2	15.0	13.2	10.8	9.0	7.2

1. International 1/4-inch rule

2. The difference between domestic production of lumber and domestic roundwood production (saw logs) in 1962 and later years largely reflects the practice of converting to pulp chips a portion of the lower grade material in saw logs. The 1952 estimate was based on a special Forest Service survey of log and lumber production.

3. Including equivalent log volumes of imported veneer and plywood.

4. Including equivalent log volumes of imported pulp and paper and board, plus plant by products.

5. Less than 0.1 unit.

6. Including equivalent log volumes of plant by products.

SOURCE: U. S. Department of Agriculture, Forest Service, Forest Resource Report #17, Timber Trends in the United States, 1965

and offices showed gains but educational buildings declined. 1/

The consumption of lumber in the United States decreased from 41,400 million board feet in 1952 to 37,300 million board feet in 1962, but is expected to increase to 39,700 million board feet by 1970. By the year 2000 the lumber consumption is expected to be 53,500 million board feet. Lumber net imports increased from 1,752 million board feet in 1952 to 4,130 million board feet in 1962.

The number of family dwellings more than doubled during the period of time from 1920-1962 as the result of the population increase in the United States from 107 million persons to 187 million persons. This figure is expected to double again by the year 2000 in line with the population figure of over 300 million. In addition to the construction of new dwellings, the replacement and repair of the older homes provide a major source of demand for the timber industry. The amount of lumber per family dwelling is decreasing although the use of plywood and other wood products are increasing in use.

Close inspection and analysis of advertisements of hardwood products presently being used in the manufacture of the best furniture products reveal the extreme shortage of hardwood lumber and other materials. This is emphasized by the fact that manufacturers are unable to specify the name of the species being used and in order to advertise their products without being subject to criticism, they resort to such practices as illustrated by the following example of a walnut finished solid wood stero cabinet:

"All exposed surfaces
of this article
are Certified to be

GENUINE HARDWOODS

A TREASURE OF THE FOREST

"This is an 'original' of natural beauty. Because no two trees are exactly alike, genuine hardwoods reveal infinite and subtle variations in color, grain, and figure. This naturalness distinguishes the genuine from the imitations. Hardwoods give to fine cabinetry a truly individual richness and character a never-ending source of pride and satisfaction." 2/

Iowa is in a little better position relative to the local production of wood products but must import much of the material for use of the several wood product industries which are distributed throughout the state. The adjoining agricultural state of Illinois is one of the leading states in the manufacturing and processing of articles made of wood. Manufacturing industries operating within this highly populated

1/ Dodge Index Tip on Housing
2/ Fine Hardwoods Association

state which has a declining forest acreage consume large quantities of wood products in making furniture, barrels, boxes, millwork, lumber, paper and paper products, flooring and other items in normal daily use.

Only 10% of the wood used by forest industries within the state of Illinois is produced from forests located within the state.

Wood Species used by Iowa Industries 1/

Apitong
Ash, black
Ash, white
Basswood
Beech
Birch, red
Birch, yellow
Butternut
Cedar, western red
Cherry
Cottonwood
Cypress, red
Cypress, yellow
Elm, soft
Fir, Douglas
Fir, white
Gum, red
Gum sap
Gum, Tupelo
Hackberry
Hickory
Magnolia
Mahogany, Honduras
Mahogany, Philippine
Maple, hard
Maple, soft
Miscellaneous mixed hardwoods
Mixed native hardwoods
Oak, red
Oak, white
Pecan
Pine, Idaho white
Pine, lodgepole
Pine, northern white
Pine, parana
Pine, ponderosa
Pine, southern yellow
Pine, sugar
Plywood and Veneer
Poplar
Redwood
Spruce, Engelmann
Spruce, Sitka
Walnut
West coast hemlock
Willow

Wood Products

Timber is available in each of the subregions of the state of Iowa for the commonly accepted wood product plants. Special consideration should be given to the construction of new industry in the form of Hardwood Utilization Centers designed to help meet the demand created by new construction which is expected to double between 1960 and 1975.

There is a trend to plants with more product integration and greater utilization of by products. Hardwood laminated decking as hardwood strips are presently being manufactured for truck trailer floors, rail car floors, and for floors in shipping

1/ Iowa State University of Science and Technology, Cooperative Extension Service, Ames, Iowa, June 1960

Water frontage is invaluable in the economic handling of crude products. These logs are moved directly to the plant site without requiring loading on a truck.

container-truck trailer combinations.

Particular emphasis should be given to the establishment of plants which can use the low grade material that is now being left in the woods both in the form of logging residue or cull trees. Specific information on processes and quantities of raw material needed in manufacture are customarily witheld by plants who are presently developing new products.

In some regions charcoal plants have been constructed to make use of waste material but pilot plants in Iowa do not indicate that charcoal can be handled on a profitable basis. Box veneer plants capable of using woodsrun material should be built only if the products can be adapted to local or regional markets so that the demand will be great enough to justify the installation of a plant. The forest resources can be well used in the form of box veneer but the trend in the use of boxes as shipping crates is on a decline and expected to decline further during the next few years.

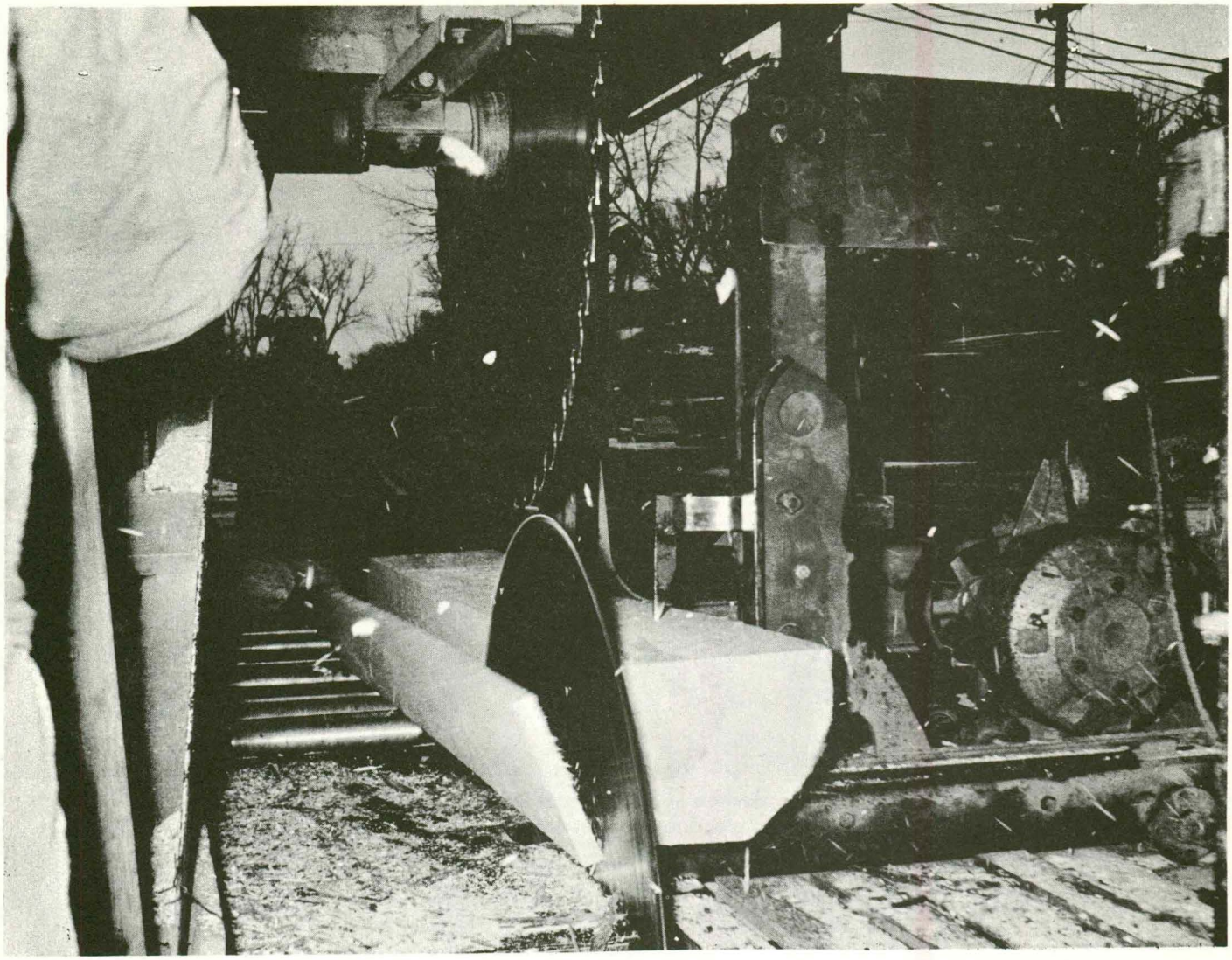
Fuel wood, post production and treatment, have not been given consideration in this study as the consumption of these items has been on a steady decline and this trend is expected to continue.

The cooperage industry is well established throughout the central states and Iowa's few plants are located near the heavier concentration of large white oak sawtimber. Most cooperage mills are movable and the plants secure the greater volume of their logs or bolts locally. This is not truly applicable to the production of stave bolts in Iowa however, as a large proportion of the stave bolts are shipped to plants located in the adjoining states. This industry could well be incorporated as one of the units of a Hardwood Utilization Center as cooperage logs are more valuable that sawlogs. Excessive waste may be reduced by harvesting the white oak trees in tree lengths so that sawlogs may be obtained above the stave cuts and pulpwood may be produced from the balance of the tree. Although cooperage-log consumption for the region was 4% greater in 1964 than in 1962, consumption in Iowa dropped.

Sawmilling has been a major industry in Iowa since the late 1700's and while continually adjusting to the availability of the timber resources, sawmills of all sizes are distributed throughout the forested areas of the state. These are relatively small plants although many are efficiently designed and make good use of electric power and operate with a minimum of labor.

New timber-handling equipment consisting of a hydraulic powered tree harvester will do the work of as many as eight men. This equipment, at the present time, will handle trees up to 16" in diameter and any length, chain-sawing them almost at ground level, and delimbing and cutting the trunks into any length desired. Although developed for the pulp and paper industry, a small adaptation of this machine will permit it to be used in the production of other wood products.

Logs of good quality and of greater than average size have been observed on the sawmill yards although many of the logs are of minimum length. The butt cuts which are impressive due to their large diameter have required the circular mills to provide a top saw as part of standard equipment.



The large size of the logs being harvested in Iowa requires the use of a Top Saw. This additional piece of equipment provides for the sawing of butt cuts.

The size of the logs on the yards indicates somewhat of a picture of the woodlots from which they have been produced in that pole size trees have been left to grow and a large volume of residue is not being used.

The principal use for hardwood sawtimber is lumber production and hardwood rough lumber goes to flooring mills, millwork plants, box and pallet makers, and furniture plants of all types. Shipment of the lumber may range from local use to distances from 50 miles to over 1500 miles. Wood using industries have need of volumes of timber well in excess of the lumber which is being produced within the state and must depend on large quantities of lumber produced in adjoining states.

There is some indication that Iowa woodlots are in the process of making a recovery from the heavy cutting which was suffered when the virgin forests were cut over to provide logs for use by the large mills which had been supplied with large volumes of timber rafted down the river from the Lake States. However, a large quantity of material to be found on the privately owned forest lands which will never be suitable as sawtimber and should be cut and removed to provide for the establishment and growth of crop trees of choice species.

Special consideration may be given to the respective species including hickory. A preliminary study was made in 1968 of the hickory species of Iowa by the Quality Control Division of the Weyerhaeuser Company and there is reason to believe that the large volume of hickory found present can be utilized to advantage by several members of industry. Not only is hickory used in the form of wood tool handles and pallet materials, but also this species is worth considering for use in the form of lumber or even veneer and plywood due to the absence of bird peck. Greater use of hickory is anticipated within the state as industry learns something more of the grade of the large volume of raw material present.

Walnut remained the front runner among furniture woods at Chicago's summer International Home Furnishings Market. In finishes, cool natural and warm natural tones continued most popular for walnut bedroom suites. Maple is the Number 2 wood in bedroom and dining room suite construction. Pecan took over the third spot in rating and oak species is fourth in position.

Unfortunately, in bedroom and dining room furniture of woods other than walnut, paint finish took over the lead. Honey tones were favored most often in the dining room furniture. 1/

Worthy of consideration is the mobile home industry that has grown steadily and the larger models require as much as 2000 feet of lumber and 500 square feet of plywood per unit, plus hardboard, insulation board, and particle board. Increasing maximum unit width to 12' created a surge that more than doubled production between 1961 and 1964. The U.S. Department of Commerce estimates 1966 sales at $1,200,000,000, up 29% from the 1964 level of $930,000,000. 2/

1/ Southern Lumberman, Nashville, Tennessee 1968
2/ Tennessee Valley Authority, Division of Forest Development

The detailed information presented here on plant sizes does not necessarily mean that these plants are of the minimum size which can be operated at a profit. The management and organization of each type of plant varies greatly so that engineering consultants are not prepared to make estimates without specific information.

The Tree Farm Family set up in southeast Iowa may be regarded as an initial step for expansion into a full utilization center. The effectiveness of the creation of a utilization center has been demonstrated by the A. DeWeese Division of the Weyerhaeuser Company which has put together several plants in order to care for the large volume of local resources which have been produced during the past twenty years.

The establishment of utilization centers may require only 120,000 cords of wood per year for an entire economic operation and the industrial units may be selected on the basis of how well they fit into the local economic and forest resource situation. A utilization center may be profitable without a pulping or fiber operation but in Iowa it can be more profitable with such an operation and it has been determined that material is available to provide for a minimum size pulp-fiber operation in each of the three survey regions. Minimum size pulp-fiber plants will have difficulty in providing a market for the available woods and plant residue plus roundwood recommended for removal in accordance with practical timber stand improvement recommendations.

The Utilization of low grade timber has been bolstered by the strong hardwood pallet business and some plants are running overtime in order to fulfill their orders. A pallet plant could provide one of the units to be considered within a utilization center.

Wood Products Manufactured by Iowa Industries 1/

Archery Equipment
Artificial Limbs
Baby seats, bassinets, cribs and playpens
Barrels, slack and tight
Baskets
Bearings, wood
Bedroom furniture and box springs
Blocking and bracing
Boards, meat cutting and bread
Boats
Boxes, ammunition
Boxes, fish
Boxes, general
Boxes, wire bound
Boxes, wagon and trailer
Boxing

1/ Iowa State University of Science and Technology, Cooperative Extension Service, Ames, Iowa, June 1960

Brooms and brushes
Buildings, portable farm
Buildings, prefabricated
Bumpers
Bungs, wirecloth
Cabinets
Cabinets, radio and TV
Car stakes
Cases, milk and beverage
Caskets and rough boxes
Counters and table tops
Crates and crating
Doors
Doors, garage
Drier cars
Elevators and drags
Farm machinery
Frames, furniture
Frames, hoist
Frames, picture
Fixtures, display, restaurant and general
Flooring, lining and repair (R.R. car)
Furniture, chrome
Furniture, general
Furniture, office and business
Furniture, repair
Furniture, unpainted
Furniture, upholstered
Gates, farm
Golf course flag poles and tennis markers
Gunstock blanks
Handles, brick and tile carriers
Handles, broom and mop
Handles, brush and duster
Handles, farm tool
Handles, garden tool
Hog handlers, breeding crates and loading ramps
Homes, prefabricated
Ladders
Ladders, stock feeders
Looms
Luggage, plywood and trunks
Machine, vending
Millwork, general
Millwork, special
Molding and trim
Nest and feeders, poultry
Novelties, wooden

Packaging
Pallets
Partitions, wall
Patterns and foundry forms
Playground equipment
Propellers, wind charger
Push carts
Racing sulkies
Rafters, laminated
Railroad ties
Refrigerator and refrigerator parts
Rocks, meat
Sash
Sash and door
Screen, combination
Shoes, wooden sole and shower
Signs and billboards
Silos
Skids
Slats, binder and combine
Slats, snowfence and corn crib
Specialties, misc.
Stock feeders
Strips, separate (clay products)
Tables
Tanks
Tanks, vats
Tents and awnings
Toys
Trailers, farm and general
Trailers, house
Trowels and floats
Truck bodies
Vats
Venetian blinds and window shades

Pallets

The extensive hardwood pallet industry has revolutionized the movement and storage of merchandise as the result of the rapidly expanding use of mechanical handling equipment. No other segment of the lumber and woods product industry has shown such a growth.

In 1967 more than 104 million wooden pallets were constructed and sold in the United States. This is the ninth year in a row in which this industry established a new sales and production record although the gain of .48% was the smallest boost in several years. During 1968 and 1969 The National Wooden Pallet & Container Association in cooperation with the U. S. Forest Service will establish the

PEP Pallet Research Project and it is anticipated that sustained growth during the next ten to twenty years will create an annual minimum 400 million pallet market. At present, this industry is the second largest user of hardwood lumber and a major customer for softwood lumber. If the increased production is as rapid as anticipated, this industry will approach the one billion figure annually and will be the second largest consumer of lumber and plywood. Crating is closely allied to pallets, requiring similar production equipment and may generally be sold to the same customers.

Raw material may consist of low quality hardwood timber commonly found in good supply in the several subregions of Iowa. Lumber may be produced from top logs cut in high quality trees or from low quality trees cut in thinning or clearing operations. Pallet production provides for the utilization of short logs which are typical of forest land areas in Iowa. Metropolitan areas containing a large concentration of energy and warehousing facilities provide ready markets for pallets and the central location of the state within the United States makes additional markets available. The cost of pallets are reasonable in that the average warehouse pallet sells for about $3.00. However, expendable pallets provide the largest dollar volume and sell for about one-half the cost of pallets which may be used over and over. A wood shaving plant could be used to absorb the waste material from a pallet and crating plant.

Pallet plants vary in size from two man operations to factories employing seventy-five persons or more. There is no seasonal limitation to employment for this industry and local labor is entirely satisfactory.

The following charts relative to minimum mechanization of plants averaging the production of three million board feet annually of pallets and crates are provided.

The production of pallets from low grade lumber may require only whatever building facilities adjoin a sawmill plant. A two man operation may not use more lumber than is normally produced at cost but will provide a market for low grade material which is taking up yard space.

PALLETS AND CRATES

Minimum Mechanization

Annual Capacity - - Three Million Board Feet of Pallets and Crates
(Equivalent to 12,000 40" x 48" Pallets based upon one
shift - 40 hour week - 50 weeks per year)

Capital Requirements

Building and Appurtenances 26,000 sq. ft. @ $4.00 sq. ft.			$104,000
Equipment	No.	Cost	
Swing saws	3	$1,200	
Single line rip saw	2	3,000	
Single spindle vert. borer	2	1,200	
Shaper	1	1,900	
Single surfacer	2	6,800	
Fork lift (1 ton)	1	5,000	
Radial arm saw	1	800	
Carts & Conveyors	1 set	2,500	
Maintenance & Misc. tools	1 set	3,500	
Band Saw	1	5,000	
Jointer	1	1,600	
Transportation and Installation		6,500	
Total Installed Equipment			39,000

Working Capital	No. of days	
Direct Material	90	40,500
Direct labor	60	20,300
Overhead and misc.	60	7,800
Total working capital		$ 68,000

Source: Tennessee Valley Authority, Norris, Tennessee, Elk River Area Study, Estimated Cost Return Data

EBP: JC 7-12-66

Minimum Mechanization (cont'd)

Materials

Lumber (#3) 3 million bd. ft. @ $50/M	$150,000
Fasteners and misc.	12,000
Total	$162,000

Utilities

Electricity 75 hp @ 1kw/hp @ 1¢/kwh (150,000 kwh)	1,500
Other fuel @ U. S. average per plant	1,475
Total	$ 2,975

Labor - one shift-40 hr. week - 50 wk/yr.

	Man Hours	Annual Cost
Managerial @ $5/hr.	2,000	$ 10,000
Clerical @ $1.60/hr.	4,000	6,400
Skilled @ $2.50/hr.	8,000	20,000
Semi-skilled @ $1.60/hr. and unskilled	64,000	102,000
Total		$138,800

Annual Costs and Revenue

Annual Costs

Direct materials		$162,000
Direct labor		122,000
Manufacturing overhead		19,375
Admin. cost and contingencies		15,000
Sales costs, discounts and bad debts		15,000
Depreciation		8,000
Equipment (10 years)	$3,900	
Building (25 years)	4,100	
	$8,000	
		$341,375
Annual sales revenue		$275,000
Gross Profit (before taxes)		$ 33,625

EBP:JC 7-12-66

Pulp, Hardboard and Particle Board

Pulpwood consumption nearly doubled between 1952 and 1962 and the 1962 consumption is expected to be nearly tripled by the year 2000. In 1952 the consumption was 35.4 million standard cords which increased to 52.9 million standard cords by 1962. The consumption is expected to be 141.5 million standard cords by 2000. Pulpwood net imports decreased from 11.0 million standard cords in 1952 to 10.1 million cords in 1962, but are expected to increase to 16.0 million standard cords by 2000.

There is no timber to waste and by the year 2000 it is anticipated that the need of raw material will require the total utilization of logging residues which are presently being left in the woods to rot. Plant residues are often burned.

In recent years the production of pulp chips from the waste material of sawmills, veneer mills, and other forest industry has increased rapidly, and amounted to 20% of all the pulpwood consumed in the U. S. in 1962. The use of hardwoods by the pulpwood plants is expected to increase to 40% of the total roundwood output by the year 2000. The percentages of hardwood used has increased from 11% in 1940 to 26% in 1962. The following factors are the reason the use of hardwood for pulpwood is expected to increase:

1. The availability of large volumes of hardwood at relatively low cost per tons of fiber.
2. The improvement of many grades of paper with the addition of hardwood pulp.
3. Improvements in the pulping processes.

The demand for building board is expected to increase 3.2 times by the year 2000. The three major types of building board are:

1. Insulation Board
2. Hardboard
3. Particle Board

The use of insulation board has not increased rapidly during the last few years and is expected to increase, but not rapidly during the next few years. The main use of the insulation board is as sheathing construction. The hardboard which is used in furniture, fixtures, millwork and cabinets, doors, paneling, siding, advertising displays, lockers, and various other products has roughly tripled between 1952 and 1962. Particle board has also shown a rapid increase during the last few years.

An indication of the annual consumption of building board for the period of 1947-1962 is shown by the following chart:

Apparent Consumption of Building Board 1947-62

(Million square feet, 1/2 inch basis)

Year	Total	Insulation Board	Hardboard	Particle Board
1947	2,277	2,091	186	-
1950	2,512	2,284	228	-
1952	2,507	2,262	245	-
1955	3,456	2,958	393	105
1960	3,787	2,843	542	402
1961	3,936	2,882	575	479
1962	4,085	2,720	760	605

Source: U. S. Department of Commerce, Bureau of the Census, U. S. Department of Agriculture, Forest Service, Forest Resource Report Number 17, Timber Trends in the United States, 1965

The pulpwood production rate during the first quarter of 1968 is at a new high. Paper and paper-board production in the U. S. for the first three months of 1968 has exceeded 12 million tons which is a new quarterly record.

This total indicates that an annual output of 48.5 million tons may be produced for 1968. All major grades of paper showed gains above the 1967 period. Paper was up about 2-1/2% and paper-board rose 5% during the three month period.

Newsprint consumption in the U.S.A. in 1967 reached 9,149,000 tons, an increase of 0.8% over 1966 and records an all-time high. 1/

For the first time, and this is of great importance, in 1959 hard hardwoods including such species as Oak, Hickory, Hard Maple, and Beech replaced soft hardwoods as the major species group used for pulpwood in the central states.

1/ Pulp and Paper, News report: Inside Industry, May 1968

It is pointed out that the low net stumpage paid to farmers and landowners of $1.00 to $2.00 per cord for pulpwood material removed as a harvest cutting or timberstand improvement measure yields an appreciable value in view of the fact that forest lands throughout the Northeast and Southeast regions may produce from five to twenty cords of pulpwood per acre. The use of the hard hardwood species enables the farmer or land manager to cut over the woodland areas and remove low grade material regardless of species.

The 1961 records of pulpwood procurement indicated that the pulpwood plants in the state imported 61% of their roundwood volume from the adjoining states. These imports are shown as follows:

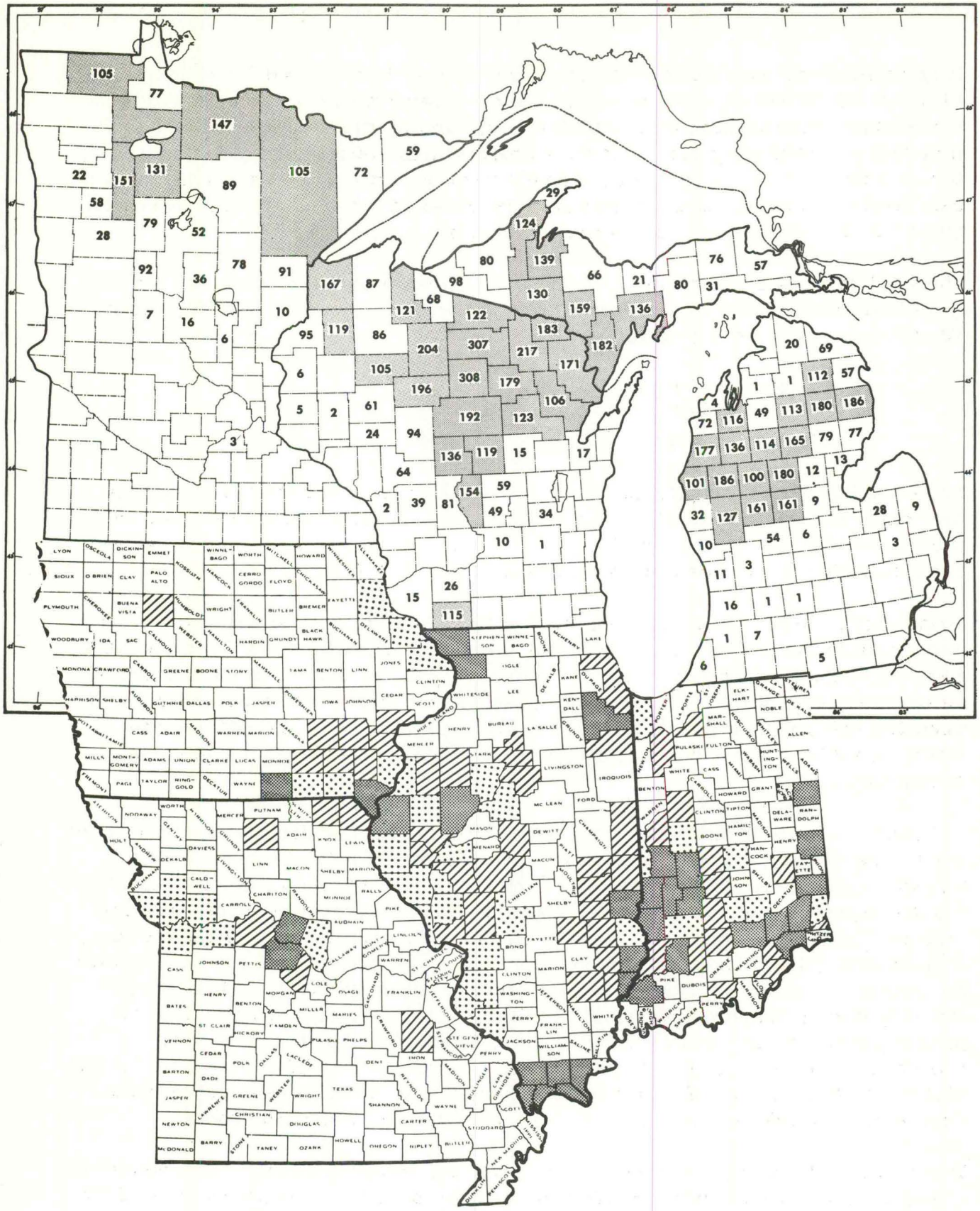
Missouri	8%
Wisconsin	16%
Illinois	37%

The establishment of additional wood using plants could provide a market for raw material of adjoining states as well as supply a much needed market for the financially mature timber of Iowa, and the undesirable trees and poor species which are in need of immediate cutting.

Wood using plants, of a minimum size, may be set up and provision made for expansion in accordance with the demand of the markets and the supply of raw material. There is great variation expressed as to the size of plants which may be operated at a profit. Many plants in existence today are family owned and operated and profits may be curtailed to as little as 75% of the net income which could be achieved if these plants were managed solely as a business enterprise.

In keeping with todays costs, labor requirements, and other factors, each plant must necessarily be considered on its own potential for the product. It is known that greater volumes of raw material must be utilized in order to provide a satisfactory margin of net profit. Records indicate that a chemical pulpmill that has low cost, high-quality wood, is close to markets, and manufactures a speciality pulp selling at a premium price may be operated economically with an output of 100 tons per day. On the other hand, a mill making kraft pulp for wrappings or paperboard, which are more highly competitive and cheaper products, would need to be much larger in order to utilize larger and more efficient equipment, unless there are site factors that would compensate for the higher production cost of a smaller and less efficient mill. As a usual case, such a mill would have a minimum daily production of about 300 tons.

There is equal question concerning the smallest economical size for groundwood, chemimechanical and semi-chemimechanical pulp mills as these may vary from a minimum of 50 to 200 tons per day to be economically feasible.



1966 harvest of pulpwood bolts by counties for Iowa and the central states.

PRODUCTION IN CORDS (ROUGHWOOD BASIS)

- LESS THAN 1,000
- 1,000 TO 2,999
- 3,000 TO 10,000

Investment costs of a chemical pulp mill may be from $70,000 to $100,000 or more per ton per day. Approximately $6,500,000 would be the minimum investment for a 100 ton per 24 hour period and a 200 ton would require an approximate investment of $13,000,000.

The investment cost in groundwood or semichemical plants without chemical recovery (not integrated with a sulphate pulp mill recovery system) is less costly and will range from $40,000 to $50,000 per ton of daily capacity.

A continuing supply of wood in quantities adequate for immediate and future requirements of the plant is the most important consideration. Wood requirements vary with the use of softwoods, soft hardwood, and hard hardwoods and requirements per ton of pulp are listed as follows:

Chemical pulping	- 1.7 to 2.4 cords per ton.
Semichemical pulping	- 1.0 to 1.7 cords per ton.
Groundwood and chemimechanical pulping	- 0.9 to 1.3 cords per ton.

Water supplies for suggested pulp mill sites are adequate due to the major rivers and streams or through wells which can supply large volumes of water as a result of the high water table. Most of the water used to manufacture pulp is recirculated within the mill and fresh water may be added to replace water evaporated in drying the product or remaining in the finished product, or to replace the amount discharged as effluent.

Improved design in new mills have lowered the direct labor requirements of the plants and the following chart indicates the need of the different types:

Chemical pulping	5 man hours per ton
Semichemical pulping	3 man hours per ton
Groundwood and Chemimechanical pulping	3 man hours per ton

The quantity of wood that is needed may be small but important as reflected by the use of shredded wood fibers which are presently being used as a filler and a binder by one local manufacturer. This unique utilization of pulp material provides an excellent market for local woodland owners.

In 1964, mill use of residues was 42% more than in 1963 in the Central States. The use of both woods and plant residue will extend the life of the roundwood volumes which are being used up so rapidly.

Source: Pulp Manufacturing Information, Forest Product Laboratory Forest Service, U. S. Department of Agriculture, Madison, Wisconsin.

RESIDUES FROM FURNITURE AND INDUSTRIAL DIMENSION PLANT
(using about 2-1/2 million board feet)

Type	Tons (green weight)
End trim	700
Cull pieces	75
Shavings	1,575
Sander dust	25
Sawdust	275
Total residue	2,650

RESIDUES FROM SAWMILLS
(producing from 4 to 5 million board feet of lumber annually)

Sawdust	-	5,750 tons
Bark	-	3,500 tons
Slabs, trim and edgings	-	10,500 tons
Total	-	19,750 tons

Slabs, trim and edgings may be chipped and sold to pulp or particleboard plants. Sawdust can go to the livestock and poultry industry for use in the curing of meat or as litter. Sometimes sawdust is sold for sweeping compounds. Bark may be used as mulch for trees and bushes.

Source: Tennessee Valley Authority, Norris, Tennessee, Elk River Area Study, Estimated Cost Return Data.

The development of specialized machinery for use by the wood procurement and woodworking departments of the timer industry is providing raw material in quantities that will extend the supply which presently exists. Research and experimentation has been underway for many years both by members of the timber industry and by laboratories sponsored by the federal agencies.

Tree harvesting machines, debarkers, and mobile chip plants are designed to produce raw material in the woods with a minimum of labor in sufficient quantities to make these operations economically feasible. Self loaders

mounted on trucks for mobility are designed so that the operator may load tree length logs, veneer logs, or pulpwood bolts. The development of equipment has in the past been designed to handle great volumes of timber but this trend may be reversed and engineering skill be applied in the development of highly mechanized mobile equipment which can produce the product found on the smaller and privately owned tracts of land.

Gas turbine powered mobile generators which are started by a 24 volt battery may be used when electricity is not available in the plant site. A fuel storage tank holding 700 gallons will operate a unit for eight hours at top capacity. Based upon a fuel consumption of 45 gallons per hour at full load and using No. 2-D oil at 10¢ per gallon for fuel alone would be $9.00 per hour.

Both woodland residues and plant residues may be utilized to provide large quantities of material so that the crop trees of choice species, spaced to grow in accordance with practical forest management practices, may be grown to larger diameter sizes approaching financial maturity. Particular attention is called to the more than 500,000,000 board feet in sound cull trees which were placed in this classification only because standard survey specifications required all logs to measure eight feet in length.

NET VOLUME OF ALL TIMBER ON COMMERCIAL FOREST LAND, BY CLASS OF MATERIAL, IOWA - 1954.

(In million cubic feet)

CLASS OF MATERIAL		TOTAL
Growing stock:		
Sawtimber trees:		
Sawlog portion	797.1	
Upper stem portion	257.0	
Total	1,054.1	
Poletimber trees	327.9	
Total growing stock	1,382.0	
Other Material: *		
Sound cull trees		189.4
Rotten cull trees		95.5
Hardwood limbs		319.6
Salvable dead trees		-
Total other material		604.5
Total all timber		1,986.5

Source: Forest Survey Release 22, March - 1959, The Forest Resources of Iowa, Central States Forest Experiment Station

* Woods residue

Hardwood Plywood and Veneer

Iowa woods provide some of the choice species for the hardwood plywood and veneer industry as follows:

Walnut
Cherry
Maple
Oak
Birch

Nationwide consumption of hardwood plywood and veneer amounted to 2.8 billion square feet in 1962. This was 23% of the total amount of the manufactured product. The demand for hardwood material is expected to increase to the figure of 8 billion square feet by the year 2000. In the year 1962 hardwood logs containing 1.8 billion board feet were used by the industry but by the year 2000 the need is predicted to be 5.9 billion board feet. The supply of veneer logs of choice species has been declining during the past few years and manufacturing processes have been developed to make greater volume production from the raw material.

A minimum size hardwood plywood plant today may need 10,000 board feet of raw material per day for economic operation, however, a larger plant could be operated more economically. Local conditions could determine the size of plant needed to meet market requirements and provision may be made for future expansion.

The following charts are provided for a representative plywood plant using 16,000 board feet per day for the production of 45,000 square feet of 1/4" hardwood plywood per day. A plant of this size would have an approximate cost of $1,000,000 and would have need of a direct labor force of 76 men and an additional general labor force of 11 to 15 men.

It is anticipated that knots, bark pockets, and other defects will eventually be accepted by the purchasers of plywood and similar products. Interior Decorators have used pecky cypress, knotty pine, wormy ash and blight killed chestnut for many years.

SPECIFICATIONS FOR A REPRESENTATIVE PLYWOOD PLANT USING 16,000 BOARD FEET (DOYLE) A DAY - 1968

Manufacturing cost to produce approximately 45,000 square feet of 1/4" hardwood plywood per day.

Labor, per day ----------	$1,240.60
Material ----------	1,920.00
16,000 log feet of timber per day @ $120.00 per M log feet	
Glue (urea resin) @ $4.00 per M square feet ----------	180.00
Overhead - 120% of direct labor ----------	1,192.32
	$4,532.92

Total manufacturing cost, per day

$$\frac{4,532.92}{45M} = \$100.73 \text{ per M square feet}$$

An average price for 1/4" gum, 3 ply, sanded dimension plywood is $135.00 per M square feet, f.o.b. mill.

$135.00
100.73
34.27 profit per M square feet

These costs do not include sales expense, cost of generating steam nor income from sale of chips.

SOURCE: Price, Howard E., The Coe Manufacturing Company, Painesville, Ohio, U. S. A. 1968

LABOR TABULATIONS	GENERAL	DIRECT LABOR
General equipment operators	66	(66)
Additional labor required:-		
Manager	1	
Superintendent	1	
Foremen	5	
Shippers and graders	4	(4)
Plywood repairers	2	(2)
Maintenance	2	
General laborers	4	(4)
Office	2	
Total ----------	87	76

WAGE BREAKDOWN, PER DAY

1 @ $40.00 per day (manager)	$40.00	
1 @ $30.00 per day (superintendent)	30.00	
1 @ $25.00 per day (skilled mechanic) (one of the listed foremen)	25.00	
6 @ $20.00 per day (foremen & mechanic's help)	120.00	
4 @ $18.00 per day (lathe & clipper operators)	72.00	(direct labor)
2 @ $16.00 per day (office help)	32.00	
72 @ $12.80 per day	921.60	(direct labor)
Total payroll per day ----------	$1,240.60	
Direct labor only, per day ----------	993.60	

EQUIPMENT REQUIRED FOR PROPOSED HARDWOOD PLYWOOD PLANT WITH CAPACITY EQUIVALENT TO 45,000 SQUARE FEET OF 1/4" DIMENSION PLYWOOD PER DAY. - 1968

Reference Drawing A-29716

Equip. Ref.	Quan.	Equipment	Elect. H. P.	Shipping Weights	Approx. F. O. B. Price	Est. frt. & Install-ation	Est. Total Cost	Labor per Day
A	8	Block steam vats		Local	$10,000	-------	$10,000	
B	1	Log yard fork lift truck		Local	10,000	Local	10,000	1
C	2	Twenty foot long Coe block conveyor to 80" Coe lathe	10	8,000#	9,000	$1,000	10,000	1
D	1	Model 761 Coe lathe charger for 80" knife length lathe	20	15,000	19,900	1,100	21,000	
E	1	80" knife length Model 263D Coe neveer lathe	32	36,000	49,500	4,000	53,500	1
F	1	Hydraulic Coe lathe back-up roll for 80" lathe	3	2,000	5,200	100	5,300	
G	1	60/85 H. P. AD-DC lathe drive	100	Prepaid	17,900	1,100	19,000	
H	1	91" Model 366 Coe short coupled clipping arrange-ment	8	14,000	22,000	2,000	24,000	3
I	2	Twenty foot long Coe block Conveyors to 56" Coe lathe	10	7,000	8,500	1,000	9,500	1

Source: Price, Howard, The Coe Manufacturing Company, Painesville, Ohio, U. S. A., 1968

Suggested Equipment - Cont'd

Equip. Ref.	Quan.	Equipment	Elect. H. P.	Shipping Weights	Approx. F. O. B. Price	Est. frt. & Installation	Est. Total Cost	Labor per Day
J	1	Model 761-B Coe lathe charger for 56" Coe veneer lathe	15	10,500#	$16,100	$1,100	$17,200	
K	1	56" knife length Model 253-D Coe veneer lathe	27	21,000	42,200	4,000	46,200	1
L	1	Hydraulic Coe lathe back-up roll for 56" lathe	3	2,000	5,200	100	5,300	
M	1	60/80 H.P. AD-DC lathe drive	100	Prepaid	17,900	1,100	19,000	
N	1	69" Model 366 Coe short coupled clipping arrangement	8	13,000	19,900	2,000	21,900	3
O	1	Coe Vert-A-Jet veneer dryer	165	139,000	75,000	7,500	82,500	12
P	1	88" Model 431 Coe knife grinder	8	7,500	6,300	400	6,700	1
Q	1	76" Coe Style "W" sizing clipper	5	3,400	3,100	200	3,300	2
R	1	66" Coe Style "W" sizing clipper	5	3,200	2,900	200	3,100	2

Suggested Equipment - Cont'd.

Equip. Ref.	Quan.	Equipment	Elect. H. P.	Shipping Weights	Approx. F. O. B. Price	Est. frt. & Install-ation	Est. Total Cost	Labor per day
S	1	Coe-Skoog OB-36M veneer patching machine	1.5	6,500#	$14,000	$ 400	$14,400	1
T	1	Veneer patcher scissors lift	1.5	2,000	2,000	100	2,100	
U	1	Coe Blank saw for Coe-Skoog veneer patcher	.25	2,000	2,500	200	2,700	
V	1	Veneer jointer	10	13,000	14,000	1,000	15,000	2
W	2	Veneer splicers	6	10,000	15,000	1,000	16,000	12
X	1	Set of glue room equipment and glue storage	15	20,000	18,000	3,000	21,000	2
Y	1	Glue spreader with roll cases, back board and scissors lift	5.5	8,000	7,500	1,200	9,200	4
Z	1	Williams-White hot plate press	30	92,000	51,000	5,000	56,000	2
AA	1	Hot plate press loading elevator and off-bearing elevators including panel rack	10	14,000	17,000	2,000	19,000	

Suggested Equipment - Cont'd.

Equip. Ref.	Quan.	Equipment	Elect. H. P.	Shipping Weights	Approx. F. O. B. Price	Est. frt. & Installation	Est. Total Cost	Labor per Day
BB	1	Panel trim saws	53	24,000#	$33,000	$3,000	$36,000	2
CC	1	High speed belt sander	60	13,000	18,500	1,200	19,700	2
DD	1	Dust collecting system	5	15,000	20,000	2,000	22,000	
EE	1	Two stage water cooled air compressor with receiver tank	50	8,000	5,000	1,000	6,000	
FF	2	Fork lift trucks		Local	20,000	-----	20,000	2
GG	1	Waste trash burner and conveyor	10	20,000	15,000	2,000	17,000	
HH	1	Gas fired package boiler	10	25,000	13,500	2,000	15,500	
II	50	Hardwood pallets		1,500	500	100	600	
JJ	1	Set of miscellaneous maintenance tools	100	10,000	10,000	2,000	12,000	
KK	1	Set of yard equipment tools (chain saws, cant-hooks, etc.)		Local	1,000		1,000	

Suggested Equipment - Cont'd.

Equip. Ref.	Quan.	Equipment	Elect. H. P.	Shipping Weights	Approx. F. O. B. Price	Est. frt. & Installation	Est. Total Cost	Labor per Day
MM	1	Steel chain core conveyor at lathes	5	5,000#	$ 7,000	$ 700	$ 7,700	
NN	1	Veneer scrap chipper	150	16,000	20,000	2,000	22,000	
OO	1	Core chipper	150	10,000	12,000	2,000	12,000	1
PP	1	Pneumatic chip conveying system including chip screens and chip-car-loading equipment	60	40,000	25,000	6,000	31,000	1
	1	Building with approximately 37,250 square feet					165,000	
TOTALS			1,256.75	640,600#	$687,600	$63,320	$916,400	66

The consumption of veneer logs in the United States has more than doubled from the year 1952 to 1962. In 1952 the consumption was 3,082 million board feet and increased to 6,776 million board feet in 1962. A similar increase is expected during the next few years and consumption is predicted to be 10,300 million board feet by 1970 and 18,300 million board feet by the year 2000. The net import of veneer logs has increased nearly six times between the period 1952-1962 and this increase in imports rose from 148 million board feet in 1952 to 860 million board feet in 1962. The net import of veneer logs are expected to be 3,400 million board feet by the year 2000.

A representative veneer plant may have a raw material requirement of 14,000 board feet of logs per day. A plant of this size would have an investment cost of approximately $500,000. Direct labor requirements may average 36 men per day and additional management and office force would increase the total number of employees to about forty-five.

Manufacturing requirements to produce approximately 100,000 square feet of 1/10" hardwood veneer per day would require about 14,000 board feet of logs. The size of the plant building in the following chart is larger than the size of building which would be required for an operation of this type and therefore provides for expansion.

Black walnut is the most highly prized veneer species today and in 1963 made up 3.3% or 32,584,000 board feet of the total cut of veneer log production in the eastern United States.

VENEER LOG PRODUCTION FOR THE STATE OF IOWA

6,696,000 Board Feet

(International 1/4 - inch)

Ash	1/
Basswood	115,000
Beech	-
Birch	1/
Black cherry	1/
Cottonwood	1/
Elm	1/
Hackberry	-
Hickory	-
Magnolia	-
Hard maple	337,000
Soft maple	223,000
Red oak	551,000
White oak	1/
Pecan	-
Sweet gum	-
Sycamore	1/
Tupelo & Black gum	-
Black walnut	4,458,000
Yellow poplar	1/
Other hardwoods	676,000
Total hardwoods	6,696,000

1/ Volumes of less than 100,000 board feet not shown separately but included in total volumes for regions and sections.

Source: U. S. Forest Service Research Note WO-6, December 1964, U. S. Department of Agriculture, Washington, D. C.

VENEER LOGS PRODUCTION - STATE OF IOWA 1966 1/
(Preliminary Statistics - Subject to change)
International 1/4-inch

SPECIES	
Hardwoods:	
Aspen	-
Ash	77,000
Basswood	587,000
Beech	-
Black Cherry	14,000
White Birch	-
Yellow Birch	-
Cottonwood	849,000
Elm	310,000
Sweetgum	-
Hard Maple	245,000
Soft Maple	320,000
White oak	30,000
Red oak	867,000
Sycamore	47,000
Yellow poplar	-
Walnut	3,138,000
Hickory	7,000
Other hardwoods	419,000
Total hardwoods	6,910,000
All Species	6,910,000

* This total does not include estimated exports overseas, but does include estimated shipments to Canada. The walnut production figures are therefore low as this is an export item.

1/ Veneer Logs Production - North Central States 1966, Data prepared by the North Central Forest Experiment Station

The month of November is characteristically used each year for building up inventory of logs used by the veneer plants. Lumber logs and veneer logs of the following species may be delivered to railroad siding or carried to the plant sites.

Walnut - Lumber and Veneer logs
Soft maple - Veneer logs
Basswood - Veneer logs
Red elm - Veneer logs
Butternut - Lumber and Veneer logs
Cherry - Lumber and Veneer logs
Hickory - Veneer logs
Red Oak - Veneer logs

High quality logs bring premium prices and shipping charges are not prohibitive as illustrated by the following chart.

DISTANCE IN MILES	FREIGHT CHARGES PER THOUSAND LOG FEET
100 miles and under	$15.00
200 miles and over 100	25.00
250 miles and over 200	30.00
300 miles and over 250	40.00
350 miles and over 300	45.00
375 miles and over 350	50.00

SPECIFICATIONS FOR A REPRESENTATIVE VENEER PLANT USING 14,000 BOARD FEET (DOYLE) A DAY - 1968

Manufacturing cost to produce approximately 100,000 square feet of 1/10" hardwood veneer per day.

Labor, per day	$ 673.20
Material	1,190.00
14,000 log feet of timber per day @ $85.00 per M log feet	
Overhead - 120% of direct labor	565.44
	$2,428.64

Total Manufacturing Cost, Per Day

$$\frac{\$2,428.64}{100M} = \$24.29 \text{ per M square feet}$$

An average price for 1/10" oak veneer is $30.00 per M square feet f.o.b. mill.

$30.00
24.29
$ 5.71 profit per M square feet

These costs do not include sales expense, cost of generating steam nor income from sale of chips.

SOURCE: Price, Howard E., The Coe Manufacturing Company, Painesville, Ohio, U. S. A. 1968

LABOR TABULATIONS	GENERAL	DIRECT LABOR
General equipment operators	29	(29)
Additional labor required:-		
Manager	1	
Superintendent	1	
Foremen	3	
Shippers and graders	3	(3)
Maintenance	2	
General laborers	4	(4)
Office	2	
Total ----------	45	(36)

WAGE BREAKDOWN, PER DAY

1	@	$40.00 per day (manager)	$40.00	
1	@	25.00 per day (superintendent)	25.00	
1	@	25.00 per day (skilled mechanic- one of the listed foremen)	25.00	
4	@	20.00 per day (foremen & mechanic's helper)	80.00	
2	@	18.00 per day (lathe and clipper operators)	36.00	(direct labor)
2	@	16.00 per day (office help)	32.00	
34	@	12.80 per day	435.20	(direct labor)
Total payroll per day ----------			$673.20	
Direct labor only, per day ----------			471.20	

EQUIPMENT REQUIRED FOR PROPOSED HARDWOOD VENEER PLANT WITH CAPACITY EQUIVALENT TO 100,000 SQ. FT. OF 1/10" VENEER

Reference Drawing A-29986

Equip. Ref.	Quan.	Equipment	Elect. H.P.	Shipping Weights	Approx. F. O. B. Price	Est. frt. & Install-ation	Est. Total Cost	Labor per day
A	4	Block steam vats		Local	$ 7,000	-----	$ 7,000	
B	1	Log yard fork lift truck		Local	10,000	Local	10,000	1
C	2	Twenty foot long Coe block conveyor to Coe lathe	10	8,000#	9,000	$ 1,000	10,000	1
D	1	Model 761 Coelathe charger for 80" knife length lathe	20	15,000	19,900	1,100	21,000	
E	1	80" knife length Model 262-D Coe veneer lathe	32	36,000	49,500	4,000	53,500	1
F	1	Hydraulic Coe lathe backup roll for 80" lathe	3	2,000	5,600	100	5,700	
G	1	60/80 H.P. AD-DC lathe drive	100	Prepaid	17,900	1,100	19,000	
H	1	91" Model 366 Coe short coupled clipping arrange-ment	8	14,000	22,000	2,000	24,000	3

Suggested Equipment - Cont'd.

Equip. Ref.	Quan.	Equipment	Elect. H.P.	Shipping Weights	Approx. F. O. B. Price	Est. frt. & Install-ation	Est. Total Cost	Labor per day
I	1	Coe Vert-A-Jet Veneer dryer	130	97,000#	$60,000	$ 6,000	$66,000	6
J	1	88" Model 431 Coe knife grinder	8	7,500	6,300	400	6,700	
K	2	76" Coe Style "W" sizing clipper	10	6,800	6,200	400	6,600	2
L	1	Coe-Skoog OB-36M veneer patching machine	1.5	6,500	14,000	400	14,400	1
M	1	Veneer patcher scissors lift	1.5	2,000	2,000	100	2,100	
N	1	Coe blank saw for Coe-Skoog veneer patcher	.25	2,000	2,500	200	2,700	
O	1	Veneer jointer	10	13,000	14,000	1,000	15,000	2
P	2	Veneer splicers	6	10,000	15,000	1,000	16,000	8
Q	1	Two stage water cooled air compressor with receiver tank	50	8,000	5,000	1,000	6,000	
R	2	Fork lift trucks		Local	20,000	-----	20,000	2

Suggested Equipment - Cont'd

Equip. Ref.	Quan.	Equipment	Elect. H. P.	Shipping Weights	Approx. F. O. B. Price	Est. frt. & Installation	Est. Total Cost	Labor per Day
S	1	Waste trash burner and conveyor	10	20,000#	$15,000	$ 2,000	$17,000	
T	1	Gas fired package boiler	10	25,000	13,500	2,000	15,500	
U	25	Hardwood pallets		750	500	100	600	
V	1	Set of miscellaneous maintenance tools	100	5,000	5,000	1,000	6,000	
W	1	Set of yard equipment tools (chain saws, cant-hooks, etc.)		Local	1,000		1,000	
X	1	Main veneer trash conveyor at lathe	5	2,500	3,000	1,000	4,000	
Y	1	Steel chain core conveyor at lathes	5	3,000	3,000	500	3,500	
Z	1	Veneer scrap chipper	150	16,000	20,000	2,000	22,000	
AA	1	Core chipper	150	10,000	12,000	2,000	12,000	1
BB	1	Pneumatic Chip conveying system incl. chip screens and chip-car loading equipment	60	40,000	25,000	6,000	31,000	

Suggested Equipment - Cont'd.

Equip. Ref.	Quan.	Equipment	Elect. H. P.	Shipping Weights	Approx. F. O. B. Price	Est. frt. & Installation	Est. Total Cost	Labor per Day
	1	Building with approximately 28,500 square feet	----	-------	-------	--------	130,000	----
Totals:	----------		880.25	350,050#	$383,900	$36,400	$539,300	29

Paneling

Of interest in connection with the production of hardwood paneling has been the development by the United States Forest Products Laboratory of a method of using crooked gnarled oaks to create a unique and strikingly beautiful wood for use as wall paneling. The revolutionary processing contributes new coloration that makes the finished product resemble chestnut or walnut. A system of sizes that simplifies installation, lowers in-place costs, and makes possible randomized installation of paneling pieces of different sizes has been developed as one of the processing steps. This provides for the use of cheap and low quality timber plus the fast simple installation technique which permits the use of wood paneling to successfully compete with other paneling materials.

The production of natural wood products has been enhanced through the demand by persons who have an interest in their personally owned furniture and office equipment. Homes and offices have been most attractively decorated by articles of wood or substitutes which closely resemble wooden articles and aluminum and metal furnishings are in use primarily by governmental or other federally sponsored offices. Articles of wood provided by timber industry and classified as pecky cypress, wormy ash or chestnut, and other woods graded for provision of "gum pockets" have enjoyed a response to requests for low grade material which has been used by individuals for homes and offices. It is anticipated that as the high grade veneer sheets become more difficult to obtain that hardwood paneling which displays the picturesque effect of defect normally associated with each species will become more desirable.

Furniture and Dimension Stock

Iowa's hardwood timber is particularly adaptable for use in the manufacture of furniture and industrial equipment for home and office. Present and ever increasing future needs for hardwood lumber, hardwood plywood and veneer are forcing the wood products industry to stretch the supply of raw material in an effort to fill the demand.

The raw material required by hardwood dimension plants may be supplied by local sawmills in the form of rough hardwood lumber. The lumber which may be manufactured in accordance with the required specifications may be marketed throughout the United States but one of the largest markets may be found locally within the state of Iowa and throughout the midwest region.

Units of the furniture and hardwood dimension industry deserve full consideration as a part of setting up a hardwood utilization center as the outlook for furniture is excellent. Public building furniture has reported a rapid growth in national sales since 1947 as indicated in the following chart.

Progressive Increase in Shipments of Public Building Furniture in the United States.

Year	Value	Average Annual Increases
1947	$ 48,342,000	--
1954	140,179,000	27%
1958	197,661,000	10%
1963	230,264,000	3%
	Projection - 1975	
1975	$518,000,000	10%

Mobile homes and truck trailers, which use dimension in their construction, have shown important gains. The price on the value of net dimension shipped, based upon customer specifications of growth and species, varies between $350 and $550 per thousand board feet.

Furniture for use in mobile homes is in great demand as production of mobile home units doubled between 1961 and 1964 and is continuing a rapid increase.

The demand upon the dimension stock industry is directly in line with the steady increase of population as the value of shipments of household furniture rose an average of 4.4% per year from 1948 to 1962.

Furniture plants may make their own dimension, but there is a trend for dependence on outside local markets. The purchase of kiln-dried parts reduces the furniture manufacturer's investment as a result of requiring less inventory, permits an accurate valuation of raw material costs, and provides for the purchase of machined wood parts which reduce waste disposal problems in the furniture plant. A manufacturing plant processing 2.5 million board feet of dried lumber annually would cost approximately $330,000 in fixed investment. Working capital of about $125,000 should suffice and training cost for the first year would probably be about $50,000. Total operating cost per year for this scale of operations would be about $610,000 and sales about $690,000 having an estimated gross profit of $80,000. Here too, net profits will depend entirely upon good management and sales ability, and the operator must have a thorough knowledge of furniture production.

FURNITURE AND INDUSTRIAL DIMENSION

SEMI-FINISHED DIMENSION

SIC 2426221 and 2426255

Fixed Capital

Land - 5 acres @ $700 plus $500 per acre for preparation	$ 6,000
Building - 25,000 sq. ft. @ $3.75 per sq. ft.	93,750
Electric wiring, etc.	10,000
Total	$109,750

Equipment	Units	Total Cost
Blowpipe system	--	$15,000
Dry kiln, 30 MBF capacity	--	25,000
Fork lift truck - 15,000 lb.	1	15,000
Automatic unstacker	1	10,500
Wood hog with motor	1	5,500
Pallets - 50 @$10.00	50	500
Lift jacks	3	750
Gravity rollers	3	1,690
Transfer carriages	2	2,700
Hydraulic scissor lift	2	6,850
Infeed saw tables	2	660
Hydracut saws	2	4,300
Crossfeed conveyors	2	3,008
Belt conveyor	1	1,570
Rip saw	1	2,520
Surfaplane	1	16,000

Source: Tennessee Valley Authority, Norris, Tennessee, Elk River Area Study, Estimated Cost Return Data

Equipment (continued)	Units	Total Cost
Belt Conveyor	1	$ 1,490
Dispatch conveyor	1	1,442
Accumulating conveyors	3	3,570
Scrap block conveyor	2	1,748
Scrap edging conveyor	1	725
Rip saw	3	15,225
Comb. horizontal & vertical borer	1	16,000
Auto shaper	1	5,500
Router	1	3,000
Mortiser	1	666
Total machinery cost		$160,914
Shipping and installation (18%)		28,965
Total installed machinery		$189,879

Working capital

Direct materials	No. of days	
Lumber	90	$ 79,375
Miscellaneous	60	2,000
Direct labor	60	25,083
Overhead and miscellaneous	60	17,337
Total working capital		$123,795

Material & Supplies

Direct Materials

Lumber KD #1 C & BTR 2,500,000 bd. ft. @ $127.00 per M	$317,500
Other materials and supplies	12,000
Total materials and supplies	$329,500

Utilities

Electricity - 200 HP @ 1 KW/HPH and 1¢/KWH		$ 4,000
Water and miscellaneous		2,000
Total utilities		$ 6,000

Labor

Management - 2 @ $5.00/hr.	$ 20,000	
Clerical (female) - 3 @ $1.92/hr.	11,500	
Skilled labor - 5 @ $2.25/hr. Male - 5 Female - 0	22,500	
Semi and unskilled - 40 @ $1.60/hr. Male - 40 Female - 0	128,000	
Total	$182,000	$182,000

Total Annual Costs

Direct materials		$329,500
Direct labor		150,500
Mfg. overhead, admin, & sales cost		104,200
Depreciation		23,378
Equipment (10 years)	$18,988	
Building (25 years)	4,390	
	$23,378	
Total annual cost		$607,578
Total annual Sales Revenue		688,275
Gross profit (before taxes)		80,697

The gradual increase in the demand for wood handles is expected to continue and the supply of raw material in Iowa suitable for this industry is unlimited. The Oak-Hickory timber type is one of the major types of timber in this mid-west state as approximately one million acres of the total forest acreage may be classified as Oak-Hickory. Over one hundred and fifty million board feet of merchantable size Hickory is present in the timberland areas. Pole size timber or growing stock is abundant and Hickory reproduction is heavy.

This industry normally operates on a small scale and the investment requirements and labor needs are not excessive. Procurement may be in the form of bolts so that production may be participated in by farmers and other small landowners.

The market radius for wood handles is extensive as it is inclusive of local use in the production of farm implements, and even small plants ship great distances to nationwide industrial markets. Hickory grows only in the United States and the export market for Hickory handles may expand as underdeveloped countries have need for more hand tools.

The recent tests made in the study of hickory bolts produced from representative timber sites in Iowa by Weyerhaeuser Company suggests that the grade of hickory species is satisfactory and emphasized that one noticeable advantage in the sample logs was the small amount of bird peck present which can be a serious defect in hickory. Due to the long shipping distance and difficulty in handling, only small bolts were used in this study and these bolts are not necessarily representative of the size of timber found as there has been almost complete lack of utilization of this species by the sawmill operators. The results of this study were summed up as "in general the weight of hickory looked good - about sixty pounds per cubic foot green weight. The grade of logs was fair but exceptionally small." 1/

The wood handle mill as illustrated here is based upon the annual use of approximately 1,050,000 board feet. The size of this plant is not necessarily representative of plants required by this industry.

1/ Harvey, Bruce, Quality Control Supervisor, Weyerhaeuser DeWeese Operations Philadelphia, Mississippi.

Product: Wood handles for striking tools, lifting and pulling tools and other hand tools.

Annual production: One shift - 250 eight-hour days. 600M handle blanks (approximately 1,050 MBF) consumed to produce about 750,000 handles of various types and sizes.

I Capital Requirements

A. Fixed	Cost ($)
1) Land 3 acres @ %750	2,250
2) Building 15,000 sq. ft. @ $5.00 sq. ft.	75,000
3) Equipment and Machinery	
Pattern saw lathes 4)) @ $7,500	60,000
Drum lathes 4)	
Double end trimmer 1 @ $1,000	1,000
Belt sanders 3 @ $250	750
Shapers 2 @ $350	700
Kiln and related equipment	15,000
Refuse blower system	10,000
Fork lift truck 1 @ $3,000	3,000
Carts and pallets (10 carts, 50 pallets)	500
Finishing and packaging equipment	1,000
Miscellaneous tools and equipment	2,750
Truck 1 @ $3,500	3,500
Furniture and Fixtures	1,500
Storage Facilities (bins)	1,000
Transportation and installation of equipment	18,300
Total Fixed Capital	$196,250

B.	Working Capital		
1)	Direct materials	90 days	20,500
2)	Direct labor	60 days	11,600
3)	Mfg. overhead	60 days	9,680
4)	Admin. overhead	60 days	11,540
	Total Working Capital		53,320
	Total Capital		$249,570
II.	Materials and Supplies		
A.	Direct Materials		
1)	Handle blanks (hickory and ash) 600 M @ $.12 ea.		72,000
2)	Paint, stains, other finishes (2,750 gal.)		2,000
3)	Packaging material		8,000
	Total direct materials		82,000
B.	Supplies		
1)	Lubricants and hand tools		4,700
2)	Maintenance and spare parts		
3)	Sandpaper		
4)	Office supplies		
	Total materials and supplies		86,700
III	Power, Fuel and Water		
A.	Electric power 150,000 kw @ .01 kw		1,500
B.	Fuel - wood residue (no cost)		
C.	Water 750,000 - 1 million gal.		200
D.	Other utility charges		100
	Total		1,800

IV Labor

A. Production personnel

1)	Skilled	4 @ $2.10	16,800
2)	Semi-skilled	8 @ $1.80	28,800
3)	Unskilled	8 @ $1.50	24,000
	Total direct labor		69,600

B. Administrative and Clerical

1)	Manager 1		8,500
2)	Supervisor-Foreman	2 @ $2.55	10,200
3)	Clerical	1 @ $1.75	3,500
4)	Maintenance	1 @ $2.50	5,000
	Total indirect labor		27,200

V Total Annual Operating Costs

Direct materials		82,000
Direct labor		69,600
Manufacturing overhead (a)		58,100
Administrative overhead (b)		69,240
Depreciation on fixed capital:	Building	3,000
	Equipment	7,940
Total Annual Costs		289,880
Annual Sales Revenue (c)		337,500
Gross Profit Before Taxes		47,620

(a) Supplies, power, fuel, water, indirect labor, truck operating cost, labor overhead, maintenance and repairs.

(b) Administrative and sales cost, taxes, insurance, legal and auditing charges and contingencies.

(c) 750,000 handles @ $.45 ea.

Source: Tennessee Valley Authority, Norris, Tennessee, Elk River Area Study, Estimated Cost Return Data

Miscellaneous Products

Walnut Kernels

A side product pertaining to the value of the black walnut tree is the marketing of the walnut kernels by the Hammons Production Company of Stockton, Missouri. In 1945 this company marketed about three million pounds and this production has increased to the extent that thirteen million pounds of walnuts were shelled in the Stockton, Missouri plant in 1962. The residue consisting of tons of shells piled up on the companies' sixty acre tract of land are ground and reduced to three granular sizes. Some of this material is added to drilling mud for use in the oil industry and other ground shells are used in sand blast operations. The shells may be used for polishing and finishing a variety of products.

Plant requirements for the storing and curing of the walnuts include the use of nineteen buildings which occupy 2000 square feet of floor space and the use of fifty-three acres of land. The possibility of using good hickory nuts at this processing plant exists as there is demand for this choice meat also.

In addition to the utilization of walnuts by the nut industry, one local firm had a quota of 300 bushels of nuts to fill for delivery to the nursery at Boscobel. Payment was made at the rate of $1.00 per bushel.

Cedar

The volume of cedar found in the state of Iowa is comparatively small but the cedar products are greatly desired. Cedar lumber for use in making cedar lined closets is provided in 3/8" thickness in order to make the supply of cedar go farther. This material is tongue and grooved to provide air tight construction and all pieces of miscellaneous lengths measuring 3" in width are used.

Aromatic red cedar shavings make the most excellent bedding for pets and one Missouri firm is packaging and distributing the red cedar nationwide under the trade name of "Pet's Pal Cedar Bedding."

Eastern red cedar is classified as a softwood within the hardwood-red cedar and oak-hickory timber types, and for the state of Iowa in 1954, was estimated to total 6,000,000 board feet (lumber scale or International I/4" rule).

Baled shavings are being shipped as far as one-half way across the United States to consumers who have need of substitutes for straw and corncobs or to be used in the curing of meat by the meat packing industry. In the northeast it is reported that the use of wood in mulches provides a farm demand for wood waste which exceeds the plant residues from local mills and factories.

Wood shavings may be used for a two-fold purpose in that they have been used for bedding of livestock and poultry and the shavings can be picked up and used as a mulch or fertilizer.

Iowa and Nebraska retailers are able to purchase baled shavings in carload lots for the price of $1.10 to $1.25 per bale. The retail price range from $1.75 to $2.75 for local users include lumber yards, feeder lots and hatcheries.

The production of material may be from both woods or plant residue and the production of the shavings as a by-product of a sawmill may be made at a lower cost than if produced by a firm manufacturing the shavings as an only product. Mobile equipment capable of producing sufficient volumes of shavings to make a woods operation economically feasible has been developed and cottonwood is a predominant species being used for chipping. For the convenience of handling and to take advantage of reduced transportation costs shavings are normally dried and baled. The volume of shavings is seven times greater than the original volume of a cord of solid wood.

It has not been determined how great a market for this material exists and it would require a market study to provide this information. It has been reported that turkeys must have bedding produced from soft hardwoods as they cannot digest the harder material.

Hickory chips and sawdust are in first priority by the five hundred or more food lockers distributed throughout the state but apparently oak sawdust may also be used for the curing of the meat. Chips or sawdust of any species may be used on the floors of the meat markets.

Potential Industrial Sites

This preliminary survey of industrial sites is provided as an indication of potential locations within each of the economic subregions of Iowa. The eastern portion of the state has greater industrial facilities but the same reasons for locating plants in this subregion may be given for locating plants in the central and western parts of the state.

The cost of a finished product, whether manufactured at the point of origin or near the ultimate market place, is about the same provided reasonably low gas rates and other factors are comparable.

Plant managers have reported that they are well satisfied with the first class quality of labor available within commuting distance of their plants. The industrial relations climate in the state and the availability of this high quality labor provides an incentive for firms to give the state full consideration.

Iowa communities are aware of the financial advantages of having an industrial plant established within their locality and are offering special concessions.

The increase in estimated income for a given community that would result from a hardwood utilization center requiring 120,000 cords of wood a year is provided as follows:

Salaries and Wages

Logging and milling	-	$5,800,000	
Trades and services	-	2,000,000	
Total	-		$7,800,000

Purchases

Wood	-	$1,300,000	
Other raw materials	-	1,100,000	
Total	-		$2,400,000

Total Economic Impact -	(Gross)	$10,200,000
	(Net)	9,250,000

Distribution of jobs for center: 1,760 jobs

Wood Manufacturing	-	49%
Other	-	45%
Timber harvesting	-	6%
		100%

Source: Hardwood Utilization Centers, Tennessee Valley Authority, Division of Forestry Development, Norris, Tennessee 1964

LANSING

History:

The settlement of Lansing started in the early fifties, but Lansing was not incorporated until 1867. Haney and Houghton purchased land and probably decided to establish a town on this site because they realized its important geographical position and its excellent landing at the river bank. This town could be a stopping-off point for settlers going west, and a marketing and transportation terminal for the abundant crops which would be raised by the incoming farmers to this newly opened land. The land holdings of Haney and Houghton eventually amounted to about 1400 acres, all of which were purchased with military land warrants. Haney and Houghton platted the town of Lansing on January 7, 1851.

Location:

Lansing, Iowa is located in the northeast corner of Iowa on the Mississippi River in Allamakee County The topography of Lansing is hilly and timber resources of this county are some of the best in the state. Three lumber mills have been located at Lansing in the past and the largest of these mills was The Shaw, Johnson, Wood, & Co. which was later known as the Hememray Barclay and Co. This mill employed 230 men at one time and was able to turn out 140,000' of lumber daily. This mill was shut down in 1893.

Transportation:

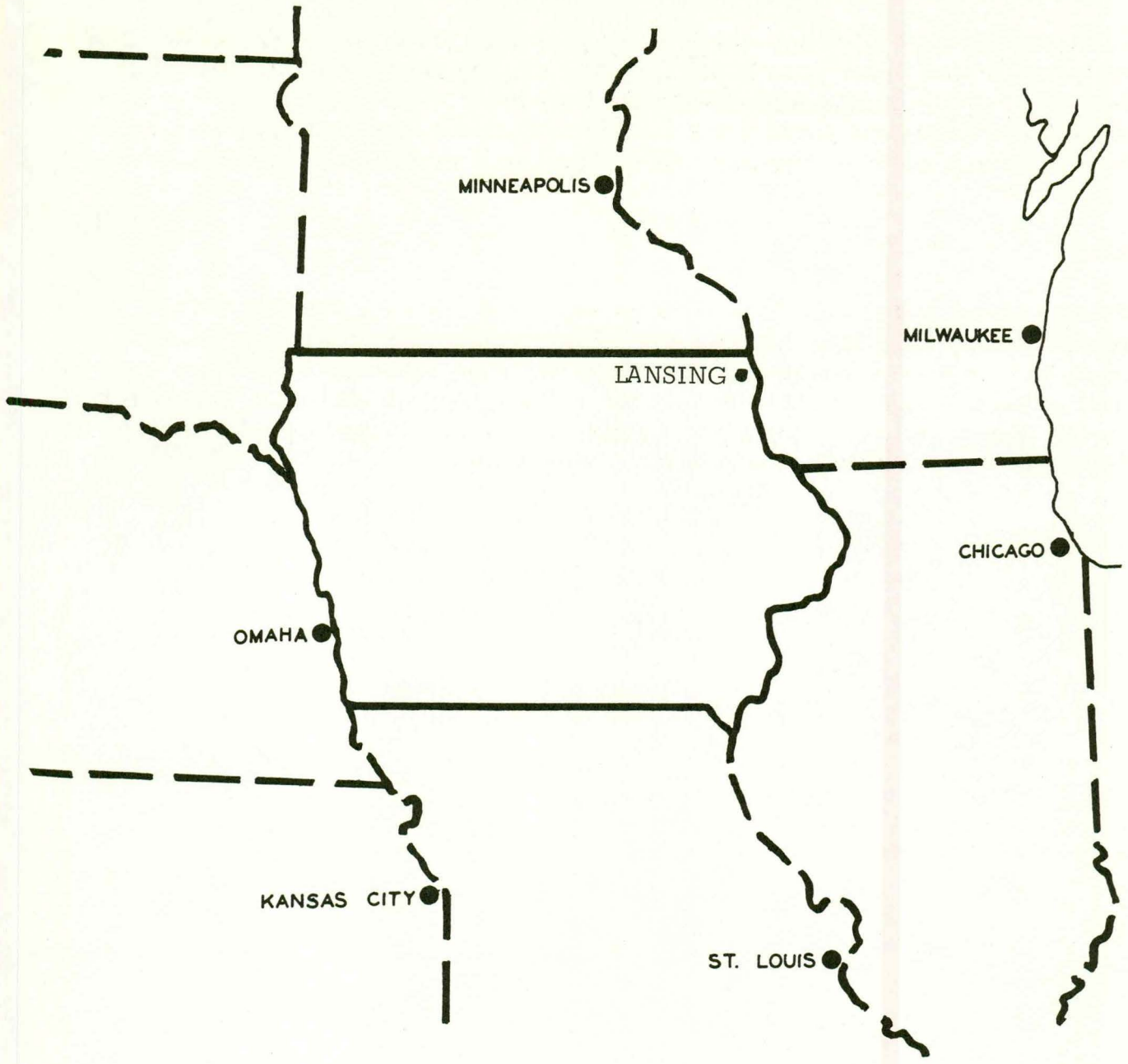
Rail transportation is furnished Lansing by the Chicago, Milwaukee, St. Paul and Pacific Railroad. Lansing is located on the Mississippi River which is part of the Interstate Waterways System and, therefore, a barge terminal can be constructed to furnish industry in this area with low cost water transporation. The nine foot channel is maintained by the U. S. Corps of Engineers and can be used about nine months out of the year. In addition, the river can be used to barge raw materials to any forest industry located in Lansing or around Lansing. Trucking companies operating in the area are abundant and transportation to most of the large midwest cities is only overnight way. The bridge into Wisconsin located at Lansing allows finished products a quick access to the market of Wisconsin. Minnesota is only a short distance to the north of Lansing and will supply additional markets for forest products produced as well as furnish an additional source of raw material supply. Commercial Air Service is available at a distance of only forty miles at LaCrosse, Wisconsin. The river, railroad and good highway facilities allow industry in this area good transportation facilities.

Power:

The Interstate Power Company which began supplying power to Lansing in 1910 was known then as the Upper Iowa Power Company and the company is still furnishing Lansing power from their dam on the Upper Iowa River twenty-one miles from Lansing. In 1948 a new interstate power plant located at the base of Atchafalaya Bluff and began supplying power to Lansing. This plant has a capacity of 63,000 kilowatts.

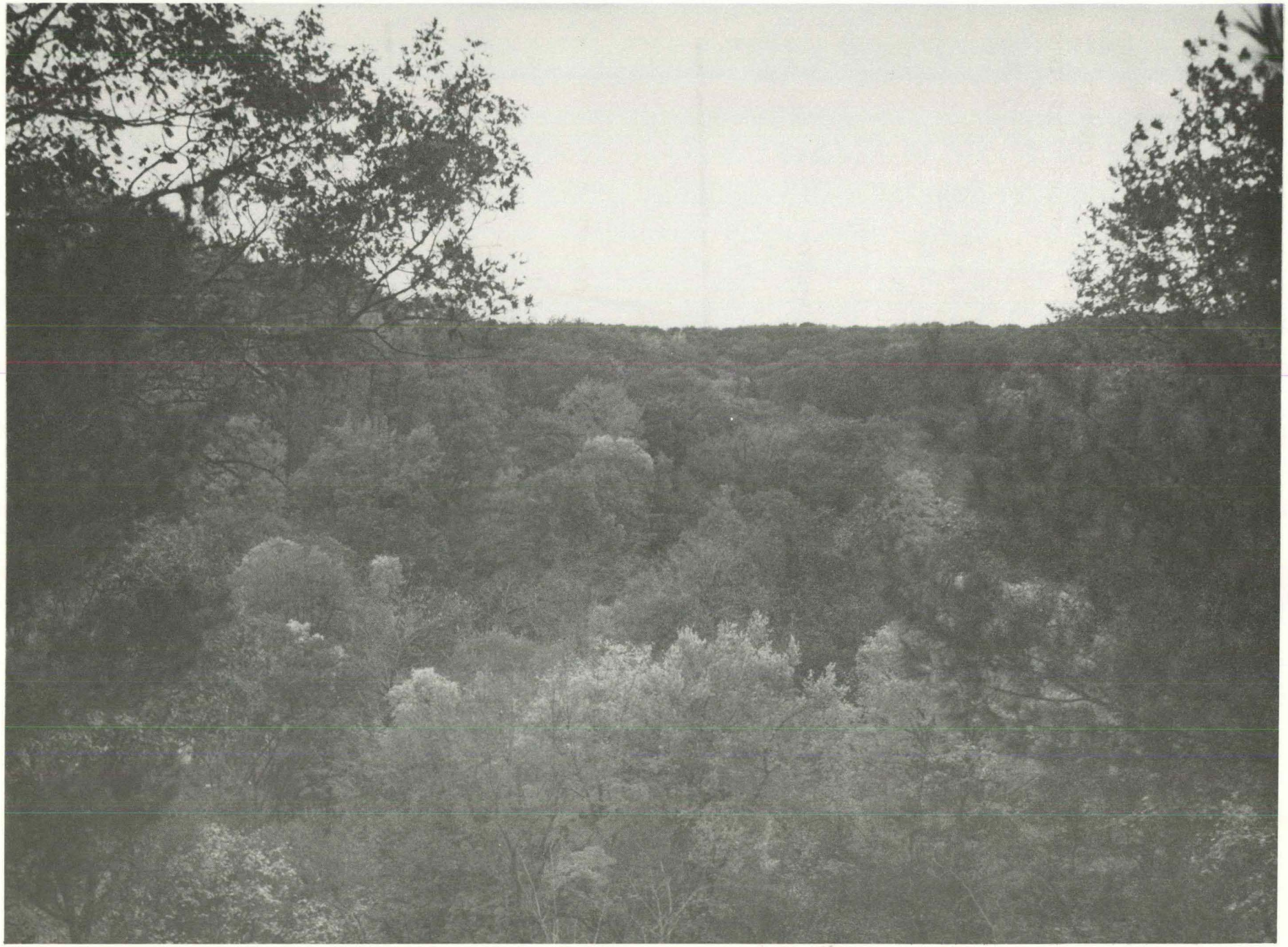
Labor:

This area of the state has a good labor supply. The labor for the most part is intelligent and industrious. A large portion of the labor is off the farm labor and possesses a skill in handling machinery and a mechanical "know-how". A mill located in Lansing could draw labor from all parts of Allamakee County and from the Wisconsin side of the river. There are six small communities within a two mile or less radius of Lansing for a labor supply.



DISTANCE FROM:

CHICAGO	290	KANSAS CITY	325	ST. LOUIS	380
OMAHA	300	MINNEAPOLIS	169	MILWAUKEE	194



Northeast Iowa Hardwood Forest Land

DUBUQUE

History:

John Dubuque became the first white settler in Iowa. He landed in 1785 at the town on the Mississippi River which is now named in his honor. He obtained a right to mine from the Fox Indians in the form of a contract in 1788. After his death in 1810 the Fox tribe again controlled the territory until the 1833 Blackhawk purchase.

After the Iowa territory had been established in 1839, Dubuque miners formed the first state legislature. In the early days of lead and zinc mining, Dubuque was a major starting point for westward immigration. Since bridges across the river did not exist, new railroads headed westward from Dubuque.

During this period logs were floated down stream from the forests to the north and Dubuque became a busy wood working city. By 1900 the mining had failed and moved to the rich deposits of Illinois and Wisconsin. Woodworking became the key industry. The first half of this century has seen Dubuque grow into a center of recreation, business, and progressive industry.

The present population of Dubuque is in excess of 63,000. The town has thirteen public schools, fourteen parochial schools, three colleges, and four seminaries. Dubuque serves as a recreational mecca for many midwesterners because of the recreational land which includes and surrounds the city. The city has thousands of miles of inland waterways at its doorstep which benefit the anglers.

Dubuque has the following advantages as the location for forest industry:

1. Sufficient labor force.
2. Location.
3. Transportation facilities.
4. Power supply.

The state of Iowa is one of the nineteen states provided with a "Right-To-Work-Law". This provides that the right of a person to work not be denied or abridged on account of membership or non-membership in any labor union or labor organization. It does not allow agreements or combinations requiring membership in a labor union or labor organization, as a condition of employment or continuation of employment and provides for rights and remedies with reference thereto.

Location:

Dubuque is located on the Mississippi River in eastern Iowa and is a crossroads of transportation. Dubuque is across the river from the northwest corner of Illinois and southwest corner of Wisconsin. This will increase the drawing area for timber resources to include Wisconsin as well as Illinois.

Transportation:

Water transportation, because of the new low bulk saving in freight costs is becoming increasingly important to Dubuque. The U. S. Corps of Engineers maintains a nine-foot channel on the Mississippi River as far north as Minneapolis, Minnesota. Navigation on the Mississippi River adjacent to Dubuque is limited to nine months at the present time, but an effort is underway to gain year round navigation on the Mississippi River.

Dubuque has four railroads operating in and out and they are as follows:

1. The Chicago Great Western Railroad
2. The Chicago, Burlington & Quincy Railroad
3. The Illinois Central Railroad
4. The Chicago, Milwaukee, St. Paul & Pacific Railroad

The Chicago Great Western Railroad is commonly known as the Maple Leaf Corn Belt route. This line concentrates on freight movement and lines terminate at Chicago, Kansas City, Omaha, Council Bluffs, and Minneapolis-St. Paul.

The Chicago, Burlington and Quincy Railroad covers 11,000 miles in fourteen states and offers connection for freight and passengers to any part of the country.

The Illinois Central Railroad serves Dubuque on its main line west. A main line freight operation with six manifest trains daily offers Dubuque shippers and receivers the best in dependable transportation. This line operates 6,460 miles of track in fourteen states.

The Chicago, Milwaukee, St. Paul and Pacific Railroad has a trunk line of 10,595 miles. This railroad's line operates from Chicago and Milwaukee; through to Kansas City, Omaha and the Pacific Northwest via Minneapolis and St. Paul

Dubuque has five federal highways to move inbound and outbound commodities. Routes 20, 3, 61, and 51 have connecting points in Wisconsin on Routes 35 and 11, and Routes 80 and 78 in Illinois.

Bus Service in Dubuque is sufficient as well as air service. Passenger bus service is provided by the Greyhound Lines, Iowa Coaches, Inc., and River Trails Transit Lines, Inc.

The airport terminal building houses the U. S. Weather Bureau and Ozark Air Lines. Ozark Airlines services Dubuque with thirteen flights daily. Five flights are to Chicago which enables one to make connection to any part of the world. Industrial sites are also available adjacent or near the airport.

Power:

Plenty of electricity is furnished Dubuque by the Interstate Power Company. It is an investor-owned utility that has an abundant supply of electricity at reasonable rates. This company has a gross capacity of 370,435 kilowatts. The companies general office is in Dubuque and serves more than 250 communities in sections of Iowa, Minnesota, and Illinois. One power plant is located in Dubuque on the Mississippi River and has a total generating capacity of 100,000 kilowatts.

Dubuque has a natural gas supply and a distribution system that is capable of handling any foreseeable industrial load. Natural gas is available to the industrial users at up to ten pounds delivered pressure. The Northern Gas Company of Omaha, Nebraska is the supplier to Dubuque.

INTERRUPTIBLE GAS RATES (Schedule A)

Class AA: Those customers using between 40 M.C.F. and 1,500 M.C.F. per month. $.50 per M.C.F. per month net. Minimum monthly charges: $10.00 per meter.

Class A: Those customers using between 1,500 M.C.F. and 2,000 M.C.F. per month. $.40 per M.C.F. per month net. Minimum monthly charges: $300.00 per meter.

Class B: Those customers using between 2,000 M.C.F. and 4,000 M.C.F. per month. $.38 per M.C.F. per month. Minimum monthly charges: $380.00 per meter.

Class C:* Those customers using between 4,000 M.C.F. and 8,000 M.C.F. per month. $.36 per M.C. F. per month.

Class D:* Those customers using between 8,000 M.C.F. and 20,000 M.C.F. per month. $.329 per M.C.F. per month.

Class F:* Those customers using over 20,000 M.C.F. per month.

Classification of each customer shall be determined by the maximum average for three-months' volume of gas used or estimated. Classification may be changed where necessary to conform to actual use figures.

Curtailment shall start with Class "F" and progress to Class "AA" for protection of firm gas customers.

* Service and rates for these customers will be subject of negotiated contracts.

Four shallow wells averaging a depth of 190' and four deep wells ranging in depth of 1500' to 1800' (deep wells used as a standby supply) supply water to the Dubuque area. These wells have a potential in Dubuque in excess of 250 million gallons per day. The wells have been municipally owned since 1900.

WATER USE RATES PER MONTH

First 300 cu. ft.	1.50
Next 700 cu. ft.	0.36 per 100
Next 1,000 cu. ft.	0.30 per 100
Next 12,000 cu. ft.	0.20 per 100
Next 35,000 cu. ft.	0.18 per 100
Next 50,000 cu. ft.	0.12 per 100

BI-MONTHLY WATER USE RATES

First 600 cu. ft.	3.00
Next 1,400 cu. ft.	0.36 per 100
Next 2,000 cu. ft.	0.30 per 100
Next 2,000 cu. ft.	0.25 per 100
Next 24,000 cu. ft.	0.20 per 100
Next 70,000 cu. ft.	0.18 per 100
Next 100,000 cu. ft.	0.12 per 100
Balance	0.12 per 100

(One cubic foot equals 7-1/2 gallons)

Maximum Amount Consumer Per Day, 1965 (July 24)	10,209,000 gal.
Minimum Amount Consumer Per Day, 1965 (January 1)	3,805,000 gal.
Average Static Pressure in Business District	88 P.S.I.
Average Daily Consumption, 1965	5,473,910 gal.

Labor:

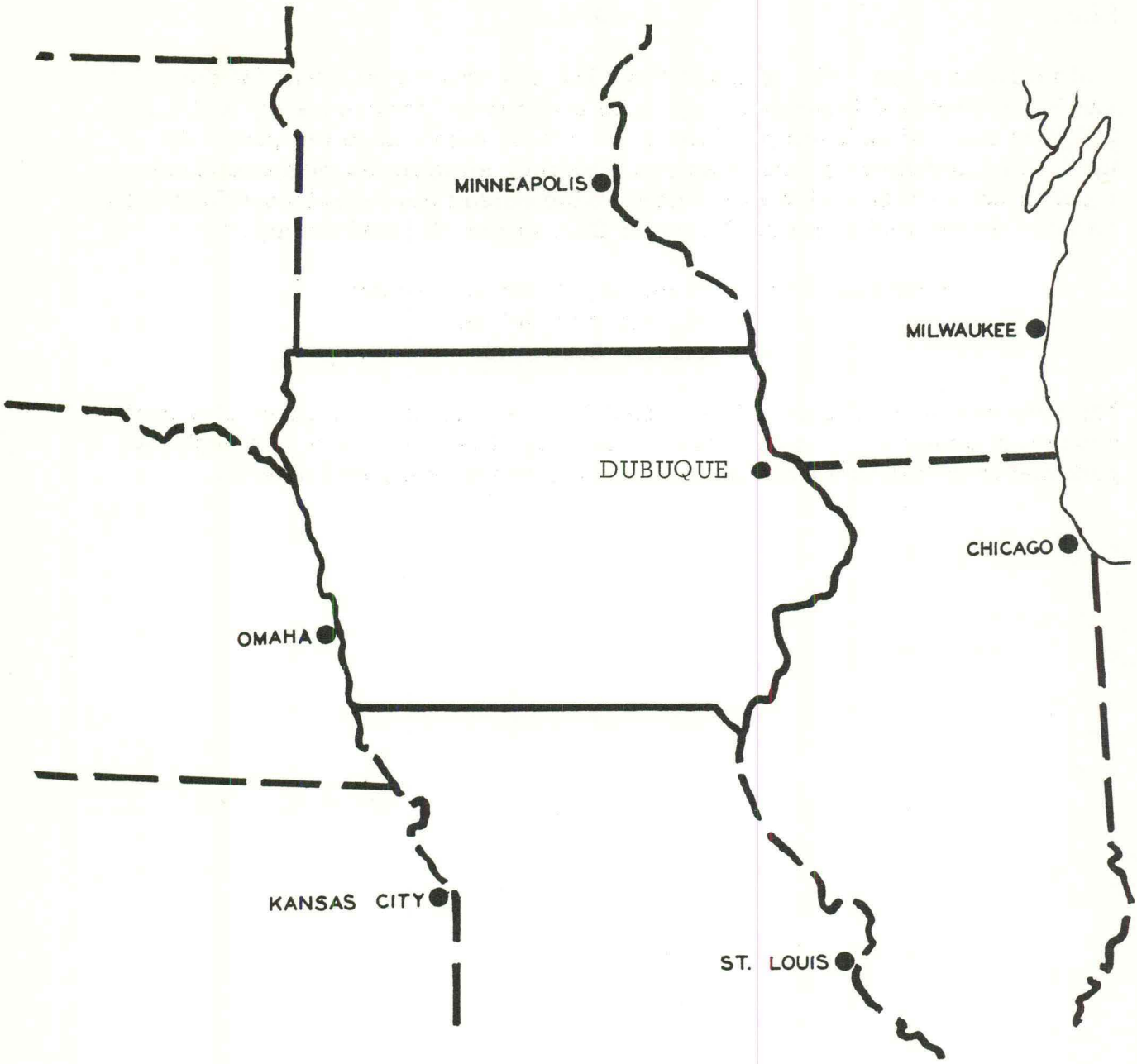
The population in excess of 63,000 people produces a large and growing labor force for industry and in addition a large number of the workmen commute from farms and outlying communities. The majority of the workmen are of German, Irish, or English stock and the labor force for the most part is intelligent, industrious, and conscientious. Dubuque has over sixty unions represented in the city.

Sites:

An Industrial Bureau was organized in 1962 and acts as an agent for the municipally-owned Industrial Park of 85 acres ready for occupancy and a 200 acre tract of undeveloped land on an island adjacent to the park. An up-to-date inventory on all sites and buildings suitable for manufacturing, processing, or fabricating is provided. The Bureau also provides information on both private and municipally owned land in the city and county.

Industrial Bureau: Manager, Robert L. Dorothy
601 Fischer Building
Phone: 588-1493

The park has access to the Mississippi River and is less than one mile from downtown Dubuque. The park has a four lane street that curves through the park and it is fully serviced by rail, power, water, gas, and sewers.



DISTANCE FROM:

CHICAGO 179	KANSAS CITY 401	ST. LOUIS 302
OMAHA 327	MINNEAPOLIS 255	MILWAUKEE 173

DAVENPORT

Location:

The town of Davenport is named after Colonel George Davenport, who, along with Antoine LeClaire, laid out the town of Davenport. The John Deere Company was founded in Davenport and the city has become known as "The Plow City".

Davenport is part of the Quad-Cities Metropolitan area which is composed of three counties. Other major cities of the area are Bettendorf in Iowa and Rock Island, Moline and East Moline in Illinois.

Transportation:

Daily freight service includes 44 trains, plus from 20 to 25 local "switchers". There is a 24-hour reciprocal switching service. The Quad-city community is located in a buffer zone between the eastern and western rail rate territories separated by the Mississippi River. This situation allows the Illinois portion of the Quad-cities to enjoy Iowa rates on traffic originating from the west and the Iowa section has Illinois rates on traffic from the east. The Quad-city area is serviceable by the following railroads:

1. Chicago, Burlington, & Quincy Railroad Company.
2. Chicago, Milwaukee, St. Paul & Pacific Railroad Company.
3. Chicago, Rock Island & Pacific Railroad Co.
4. Davenport, Rock Island, and Northwestern Railway Co.

Twelve passenger trains provide direct connection with the following cities each day.

1. Kansas City
2. Los Angeles
3. St. Louis
4. Chicago
5. Omaha
6. Denver

Sixty-nine motor carriers make scheduled stops in the Quad-city area. About 450 trucks are out-bound from the area during a 24 hour period. Overnight service to the following listed cities is possible.

1. Cleveland
2. Detroit
3. Minneapolis
4. Cincinnati
5. Omaha
6. Kansas City
7. Louisville

Water transportation is possible from the Quad-city area due to the Mississippi River's nine foot channel. The channel is maintained by the U. S. Army Corps of Engineers and is open about 9 1/2 months each year. During 1964 over 14,000,000 tons of freight moved by barge to or through the Quad-cities. The barge service gives the following advantages to industry in the Quad-city area.

1. Bulk movement at low cost.
2. Highly advantageous tariffs.
3. Direct access to export markets.
4. Favorable delivered prices on some export commodities.

Air facilities in the Quad-cities area are above average. Present air service is supplied by United Air Lines and Ozark Air Lines. Transfer over Chicago for a number of the longer hauls is necessary but excellent connection available there gives good air travel time to major cities.

Power:

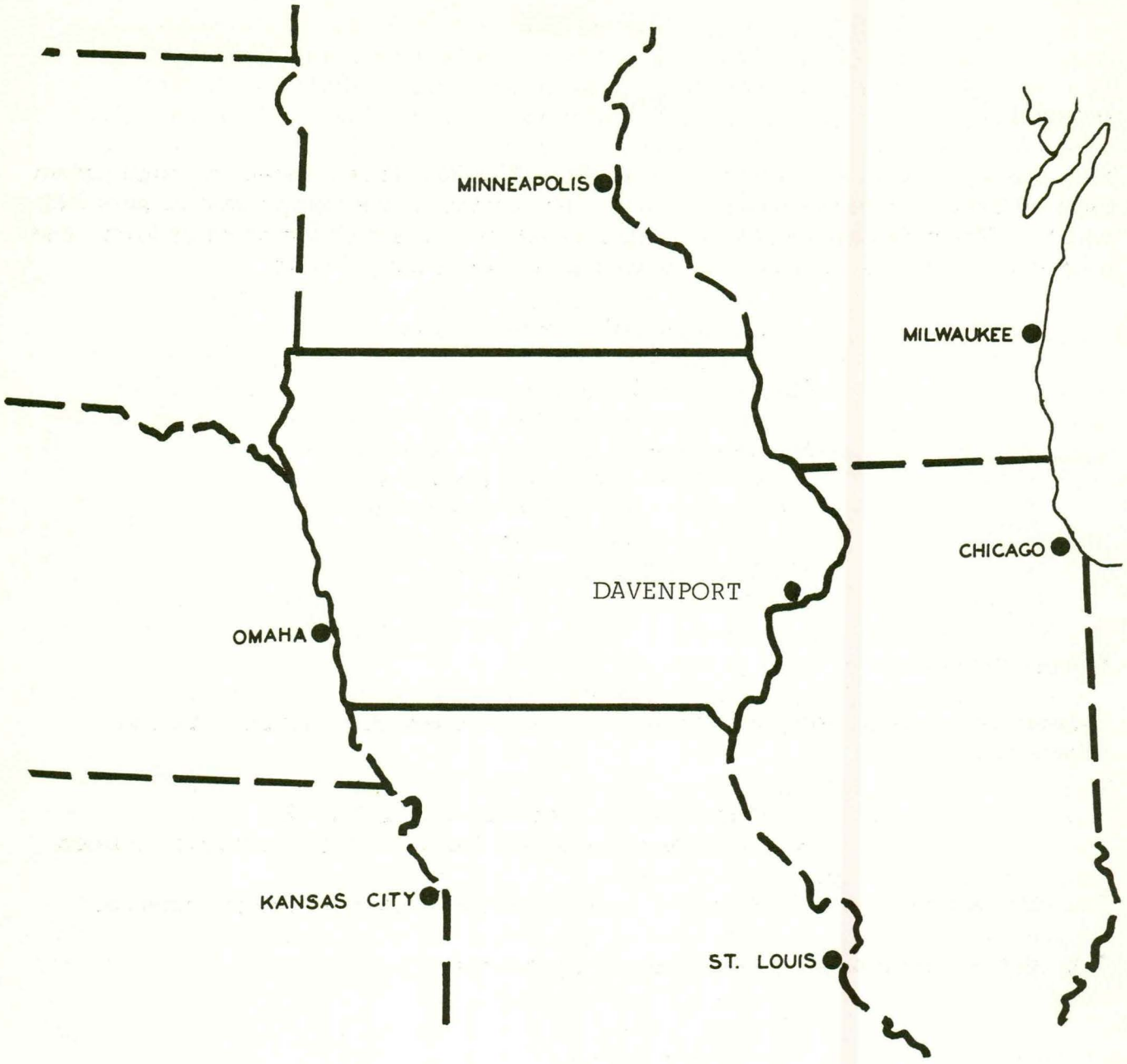
The Iowa-Illinois Gas and Electric Company, an investor-owned utility with its headquarters at Davenport, supplies gas and electricity to the Quad-city area. This company has a generating capability of 413,155 KW. Substantial interconnection with other utility systems throughout this area provides additional available capacity and further assurance of service continuity.

Straight natural gas is distributed by the Utility and has adequate capacity for present and future loads available from its suppliers. The three sources of gas through the feeder lines are the Texas Panhandle Dual Line, The Gulf Coast Line, and the Herscher underground storage.

An available surplus capacity of water running to as much as 6,000,000 gallons per day is produced by all the cities in the area. The Mississippi River provides this area with an inexhaustible supply of water.

Labor:

The employment pool covers a thirty mile radius and the labor force is over 160,000. Part of the labor drawing area is on the Iowa side of the Mississippi and part on the Illinois side. The number of residents of the Quad-city area increased 6.1% between 1960 and 1965. The labor has a near perfect job attendance record during the last ten years. Although unemployment is relatively low there are always people for the jobs available because of the large drawing area.



DISTANCE FROM:

CHICAGO	165	KANSAS CITY	350	ST. LOUIS	234
OMAHA	317	MINNEAPOLIS	336	MILWAUKEE	202

MUSCATINE

Location:

Muscatine, Iowa is a city of a population of 23,000. It is located in southeastern Iowa adjacent to the Mississippi River. Muscatine is the county seat of Muscatine county. The city has the largest municipal electric plant in the state of Iowa, and a great asset to Muscatine is an abundant supply of ground water.

Distance and Direction from:

Chicago - 200 miles west
Omaha - 290 miles east
Minneapolis-St. Paul - 335 miles south
Kansas City - 337 miles northeast
Milwaukee - 229 miles southwest
Denver - 840 miles east
St. Louis - 221 miles north

Transportation:

Muscatine has daily freight and passenger service which is supplied by the following railroads:

1. The Chicago, Rock Island, & Pacific
2. The Chicago, Milwaukee, St. Paul & Pacific Railroad

The city has a union local terminal which includes passenger freight service.

The shipping time to principal cities is as follows:

Chicago - 12 hours
St. Louis - 2nd day
New York - 5th day
Minneapolis - 2nd day
Houston - 4th day
Boston - 5th day
Denver - 2nd day
Los Angeles - 6th day
Detroit - 4th day

These are from truck terminals in Muscatine and one company has its general office in Muscatine. There are six common carriers serving Muscatine and the number of common carriers are many and varied. The shipping time to principal cities on a truckload basis would be as follows:

Chicago - Overnight
St. Louis - Overnight
New York - 5th day
Minneapolis - Overnight
Houston - 3rd day
Boston - 5th day
Denver - 3rd day
Los Angeles - 5th day
Detroit - 2nd day

Charter service is available at Muscatine Aviation, Inc. to any place in the United States, Canada, or Mexico. The Aeroline Flight service is located about 2,5 miles from the city limits. The hangers are sufficient to handle 40 private planes and the two runways are completely surfaced and lighted. Not any scheduled airlines serve Muscatine.

Water transportation is furnished Muscatine by both private and public barge facilities. Sixteen million tons of products passed through the Muscatine Lock #16 during the 1961 season. The shipping on the river is for a nine month period or longer each year. The barge facility has not only opened the markets of the world to Muscatine but has had an important effect on all schedules of freight rates. The normal shipping time would be:

Kansas City - 6 days
St. Louis - 2 days
Cincinnati - 14 days
Minneapolis - 2.5 days
New Orleans - 12 days
Chicago - 4 days

Power:

The Muscatine Municipal Water and Electric Plants are municipally owned. Muscatine has the largest municipal electric plant in the state of Iowa. Primary voltage can be provided up to 69,000 volts and secondary voltage can be supplied in any amount.

Power capacity - own plant 49,250 KW
Power Interconnection (two utilities) 20,000 KW

Large power rates are as follows:

Demand Charge:

First 500 KW Billing demand $1.75 per KW
All over 500 KW Billing demand $0.90 per KW

Energy Charge:

First 300 hrs. use of maximum demand .9¢ per KWH
All additional energy used per month .6¢ per KWH

The Iowa Electric Light and Power Company supplies gas to Muscatine and is an Iowa Investor Utility. The supply is available up to 45,541,000 cubic feet per day, but additional supplies are available if sufficient time is allowed for the suppliers to meet the request.

Rate schedule of large Interruptible Service

First 200,000 cu. ft. per month for $115.00
over 200,000 cu. ft. per month @ 3.3¢ per 100 cu. ft.
(Minimum charge shall be $115.00 per month per meter)

Water is supplied to Muscatine by the Muscatine Municipal Water and Electric Plants. The water comes from a vast underground sand and gravel aquifer at the south edge of the city. The total volume available is 16,800,000 gallons per day.

Rate Schedule

Cu. Ft. per month	Cost per 100 Cu. Ft.
First 500	30¢
Next 1500	28¢
Next 3,000	16¢
Next 45,000	10¢
Over 50,000	7¢

Labor:

The population of 23,000 is made up of German, United Kingdom, Netherlands, Poland and other national origins. Eleven percent of the population is foreign born. The labor population for the most part is resourceful, educated, and responsible.

Sites:

Muscatine's Progress Park is located one and one-half miles from the city limits. The Muscatine Development Corporation owns and manages the two hundred twenty-five acre industrial park. The park has the following facilities installed:

a. A 13,800 KV Power Line installed by Muscatine Municipal Water and Electric Plants to serve all lots. Also a 69,999 KV Power Line of Eastern Iowa Light & Power Cooperative intersects the property.

b. Natural Gas pipeline extended by Iowa Electric Light and Power Company into sites to serve all lots.

c. A new eighty-foot road constructed by Muscatine county through the center of the sites to serve all lots.

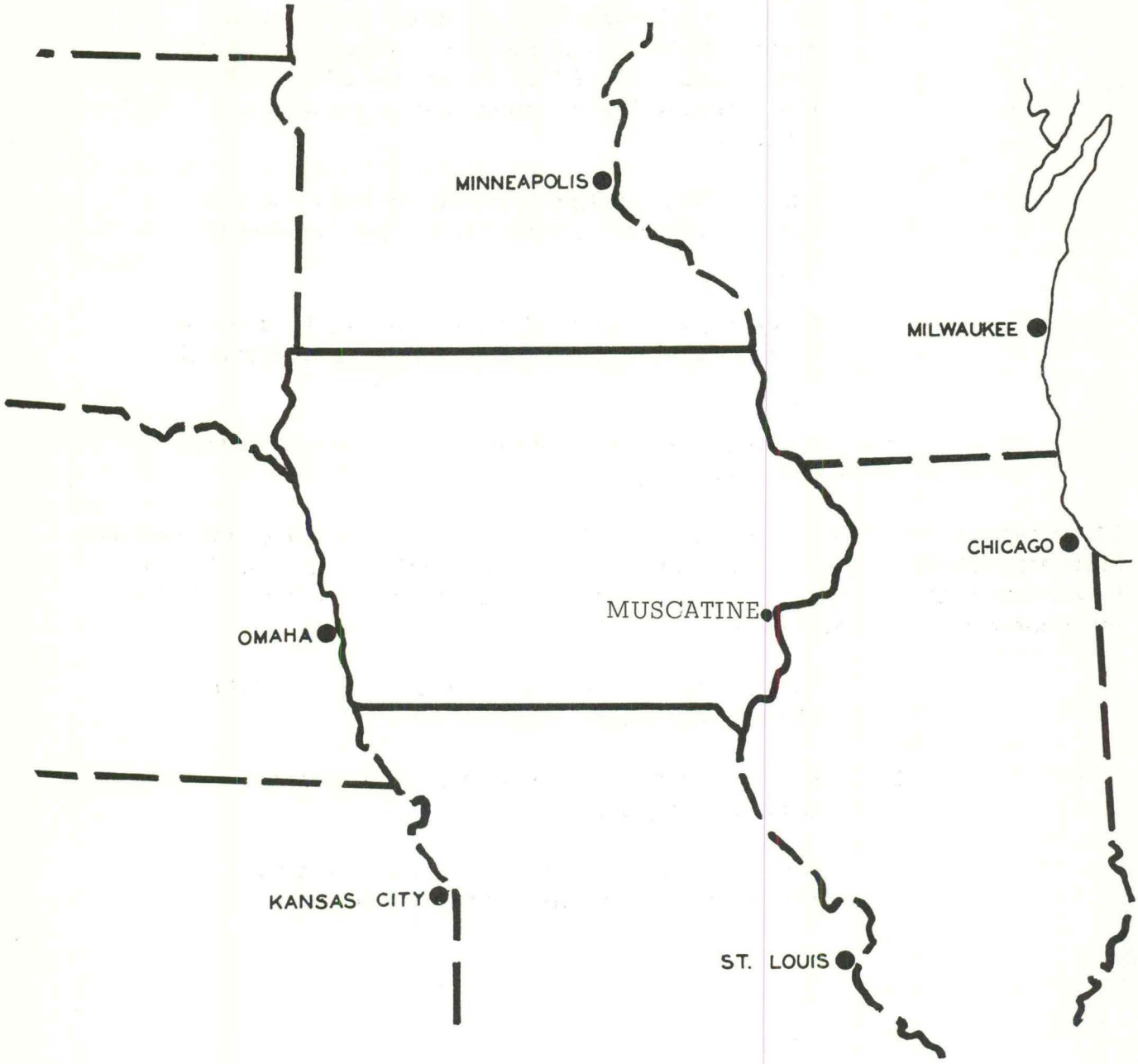
d. A new 3,300 foot railroad spur through the center of the property.

Other available sites are available to industry and can be acquired through the Muscatine Development Corporation. The following sites controlled by the Development Corporation but owned by private parties who wish to sell at a reasonable price are as follows:

1. Seventy-three acres on the deep channel of the Mississippi River.

2. Fifty-two acres on the deep channel of the Mississippi River.

3. Forty acres inside city limits - all utilities plus railroad and federal highway access.



DISTANCE FROM:

CHICAGO 200	KANSAS CITY 337	ST. LOUIS 221
OMAHA 290	MINNEAPOLIS 335	MILWAUKEE 229

KEOKUK

History:

Keokuk, Iowa is named for Chief Keokuk, chief of the Sac Indians. Keokuk, "the watchful fox", was not a hereditary chief but raised himself to that dignity by the force of talent and enterprise. The first white man to settle permanently within the present limits of the city was Dr. Samuel C. Muir, who erected a log cabin in 1820 near the junction of Main and Water Streets.

Location:

Keokuk is located in the southeast corner of the state of Iowa in Lee County, Iowa. It is at the junction of the Des Moines River and the Mississippi River. East of the Mississippi lies the state of Illinois and southwest of the Des Moines River lies the state of Missouri. The city is located on bluffs approximately 200 feet high and has an average altitude of 655 feet.

Transportation:

Keokuk, Iowa is serviced by four railroad companies which provide the city daily passenger and freight service. There are four local terminals of which three are freight terminals. The following is a list of the railroads that serve Keokuk.

1. Chicago, Burlington, & Quincy Railroad Company
2. Chicago, Rock Island & Pacific
3. Norfolk and Western
4. Toledo, Peoria & Western

Shipping time to principal cities on carload basis:

Chicago - 18 hours
Memphis - 2 days
Denver - 2 days
St. Louis - 16 hours
Houston - 3 days
Los Angeles - 4 days
New York - 5 days
Boston - 6 days
Detroit - 2 days

Trucking service has fourteen common carriers serving the area and there are two local, one intrastate and eleven interstate. There are four terminals. The

shipping time to principal cities is as follows:

Chicago - overnight
Memphis - overnight
Denver - 2nd day
St. Louis - overnight
Houston - 3rd day
Los Angeles - 4th day
New York - 3rd day
Boston - 4th day
Detroit - 2nd day

Keokuk, Iowa presently does have barge facilities which provide low cost shipping.

Shipping time to the following:

Kansas City - 8 days
St. Louis - 2 days
Cincinnati - 6 days
Memphis - 3 days
New Orleans - 9 days
Chicago - 5 days

The nearest air service is at a distance of forty miles at Quincy, Illinois or Burlington, Iowa. However, charter service is available at the local airport. Lindner Aviation, operators of Municipal Airport, maintain services for local industrial and private interest.

Power:

The Union Electric Company, a private corporation, services Keokuk, Iowa. The company has a capacity of 3,500,000 KW and has scheduled expansion of 525,000 KW for 1966 and 1968.

RATES FOR INDUSTRIAL SERVICE

UNION ELECTRIC COMPANY

The exact cost of power to an individual industry will vary with the size of the load to be supplied and the relative amount of use of this load, or its load factor.

Typical average rates for various load conditions are shown below:

Monthly Demand in KW	200 kwh/kw 27% Load Factor kwh/month average	rate ¢/kwh	400 kwh/kw 55% Load Factor kwh/month average	rate ¢/kwh	600 kwh/kw 82% Load Factor kwh/month average	rate ¢/kwh
200	40,000	1.864	80,000	1.334	120,000	1.091
500	100,000	1.735	200,000	1.270	300,000	1.048
1,000	200,000	1.692	400,000	1.248	600,000	1.033
2,000	400,000	1.603	800,000	1.164	1,200,000	.947
5,000	1,000,000	1.550	2,000,000	1.086	3,000,000	.895
10,000	2,000,000	1.532	4,000,000	1.054	6,000,000	.853
20,000	4,000,000	1.383	8,000,000	.971	12,000,000	.798

The above rates are for primary service and include a fuel adjustment of .004 cents per kwh which is the average adjustment for the twelve months ending December 31, 1965. The fuel adjustment is based on the average cost of fuel above or below 20¢ per million BTU.

More detailed rate information for a specific case will be gladly furnished. Requests for information should include all known data and estimates regarding the total connected load for all light and power requirements, estimates of probable actual maximum loads and the hours of operation.

In addition to furnishing detailed rate information, the Industrial Engineers of the Union Electric Company are available for assistance in the matters of special applications for electric power to manufacturing processes.

Keokuk Gas Service Company provides gas service to the city and is a privately owned company. The company purchased gas from the Michigan Pipeline Company by yearly contract. The present usage is 10,600 MCF. Additional volume can be purchased as needed. The gas rates are as follows:

RATES
KEOKUK GAS SERVICE COMPANY

FIRM INDUSTRIAL SERVICE

First	1,000 MCF	@	$.51 per MCF
Next	1,000 MCF	@	.49 per MCF
All additional		@	.46 per MCF

Minimum Monthly Charge - $150.00

INDUSTRIAL INTERRUPTION SERVICE

First 1,000 MCF	@	$.47 per MCF
All additional	@	.414 per MCF

Minimum Monthly Charge - $235.00

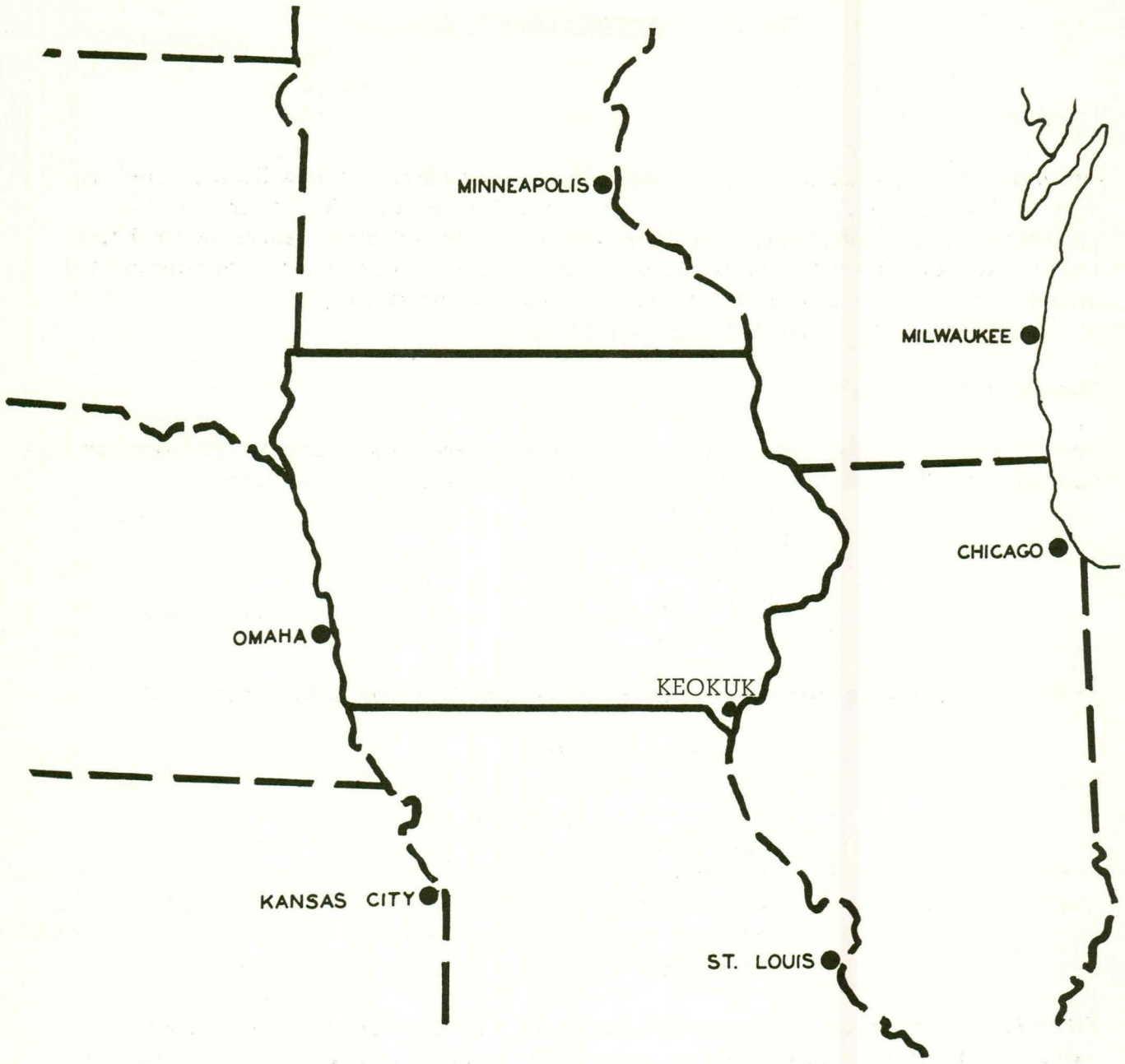
The water supply is abundant and the source is the Mississippi River. The Keokuk Municipal Waterworks has a volume available at the present time of 7.5 million gallons of filtered water and thirteen million gallons of raw water. The average daily consumption is 3.6 million gallons.

The following is a computation of water and sewer charges by gallons.

Consumption Gals. per month	Water Charge	Sewer Charge	Total
500,000	$111.81	$94.45	$206.26
1,000,000	198.62	159.60	358.22
2,000,000	372.62	289.60	661.62
5,000,000	892.22	679.60	1571.82
10,000,000	1759.22	1329.60	3088.82

Labor:

The labor supply is no problem in Keokuk, Iowa. Two-thirds of the labor force comes from within the city. The other one-third is from within a thirty mile radius. The "Right-to-work law" is in effect in Iowa so includes the town of Keokuk. There is a variety of unions in Keokuk and the town is not dominated by one union. The labor for the most part is intelligent and possesses a tool and machine "know-how".



DISTANCE FROM:

CHICAGO	248	KANSAS CITY	240	ST. LOUIS	185
OMAHA	300	MINNEAPOLIS	425	MILWAUKEE	400

OTTUMWA

Location:

Ottumwa, Iowa is located in southeast Iowa on the Des Moines River. The city was subject to flooding for many years by the Des Moines River, but now a straightened river channel, with levies and a hydro-electric dam to control the water, protects the city. The former river channel has now been connected to a ninety acre lagoon, suitable for water recreation and fishing.

Transportation:

Four major railroads serve Ottumwa and provide passenger and freight service that compares with the best in the country. The railroads are as follows:

1. The Burlington
2. Wabash
3. Milwaukee
4. Rock Island

Eight major markets that are within a 300 mile radius are listed below:

1. Minneapolis-St. Paul
2. Milwaukee
3. Chicago
4. Quad-cities
5. St. Louis
6. Kansas City
7. Omaha
8. Des Moines

Fifty-four truck lines provide overnight motor transportation to all midwest cities. Shipping is simplified to any part of America because Ottumwa is near the geographical and populated centers of the United States. The Ottumwa Transit Lines provide local mass transit service.

Power:

Power is supplied to Ottumwa by the Iowa Southern Utilities Company and the Iowa-Illinois Gas and Electric Company. Both of these utility companies are within the Iowa Electric Grid System.

GAS-SAMPLE RATE

For the first 500 Therms - 5.01¢ per therm
For all in excess of 500 Therms - 4.01¢ per therm

Minimum Charge - $100 per month

The two listed companies above offer an unlimited supply of power to Ottumwa.

Labor:

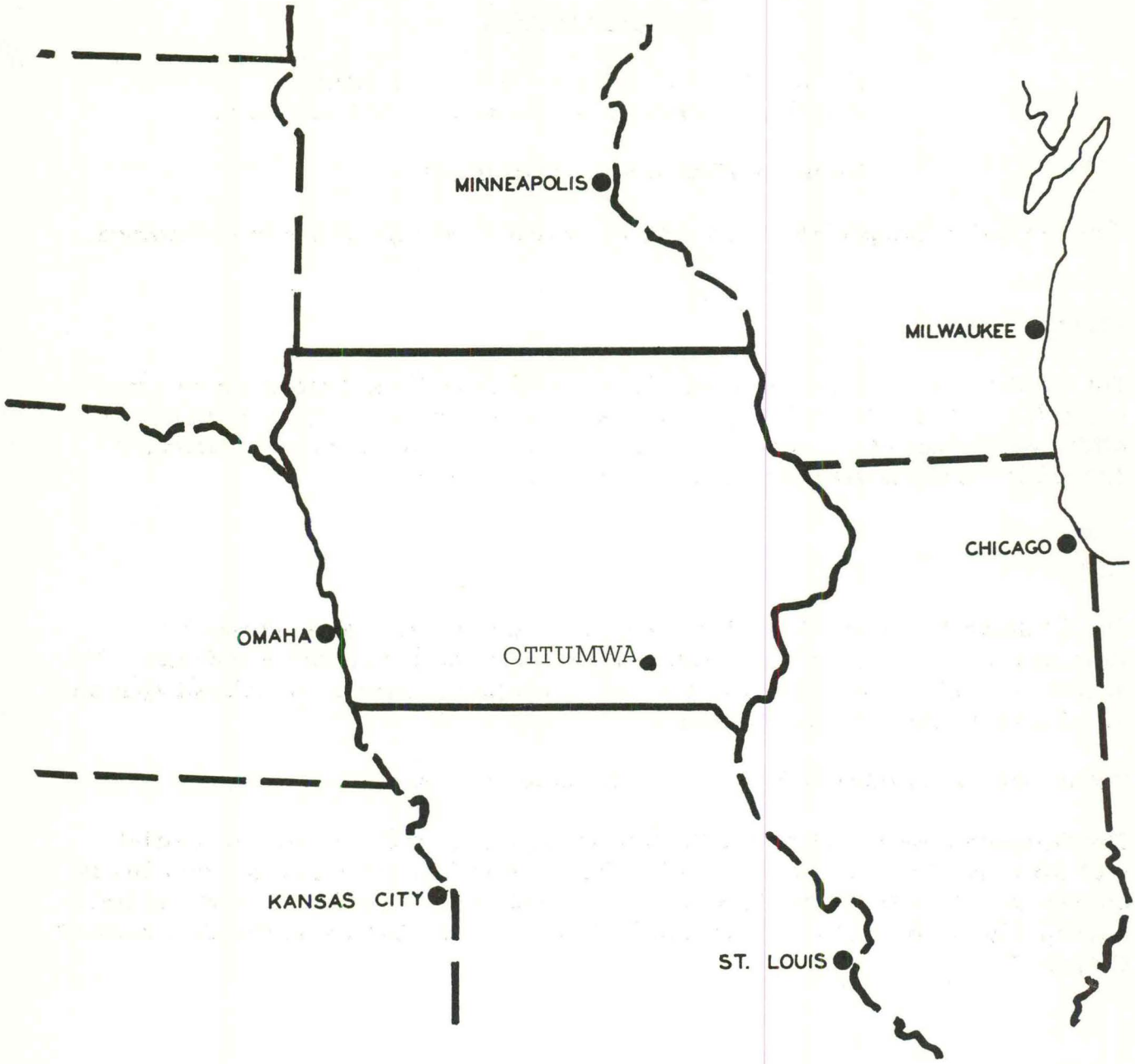
The public school system is rated "far above average", and produces an educated labor supply for industry. Ottumwa is the home of Iowa Tech which offers vocational and technical instruction and keyed to needs of industry. The labor supply is adequate and educated for the most part.

Sites:

The Ottumwa Municipal Airport has a number of sites available for use by light and heavy industry. In addition it has building available for industry. The airport consists of a 1440 acre tract which has paved streets, a railroad spur and all necessary utilities for industry.

The airport has a total of 20 buildings for sale or lease.

The Ottumwa Area Development Corporation has acquired a 97 acre industrial site from the city at a cost of $1.00. This site is located within the city limits on new four-lane U. S. Highway 63N. The area was formerly the cities airport. Reasonably priced sites are now available through the Ottumwa Area Development Corporation.



DISTANCE FROM:

CHICAGO 280	KANSAS CITY 205	ST. LOUIS 250
OMAHA 200	MINNEAPOLIS 340	MILWAUKEE 315

SIOUX CITY

Location:

Sioux City, Iowa is at the junction of the three states of Iowa, Nebraska and South Dakota. It is also near the southwestern tip of Minnesota. Sioux City is the county seat of Woodbury County and has a population of over 90,000. It is located at the north westernmost tip of the inland waterways system. The altitude of the city ranges from 1097' above sea level to over 1400'. The topography of Sioux City is hilly with the land rising from river valleys steeply to the top of the bluffs.

Transportation:

Railroads serving Sioux City offer services to all sections of the nation. Daily freight and passenger service are offered with reciprocal switching occurring within the Sioux City district. Three freight terminals are operating in the area.

SHIPPING TIME

Chicago - 10 hours	Detroit - 2 days
Minneapolis - 12 hours	New York - 3 days
Denver - 1 day	Boston - 3 days
St. Louis - 2 days	Los Angeles - 4 days
Houston - 2 days	

The following railroads serve Sioux City:

1. The Chicago Milwaukee, St. Paul & Pacific
2. Chicago & Northwestern
3. Chicago, Burlington, Quincy
4. Illinois Central
5. Great Northern

Nearly all the major highways into Sioux City have been widened, straightened, resurfaced, or rebuilt entirely. The following is a list of highways that serve Sioux City:

Federal	State
U. S. 75	12
U. S. 77	7
Interstate 29	230
U. S. 20	141

Common motor carriers provide excellent service to the Sioux City area. From the Sioux City area the entire upper midwest is only overnight away. The following is the delivery time by motor carriers from Sioux City.

Detroit - 18 hrs.	Omaha - 3 hrs.
New York City - 36 hrs.	Minneapolis - 8 hrs.
Seattle - 56 hrs.	Chicago - 14 hrs.
Los Angeles - 48 hrs.	St. Paul - 8 hrs.

Two barge terminals operate in the immediate area of Sioux City and they are as follows:

1. Frontier Marine Terminal
2. Big Soo Terminal

Since Sioux City is located on the Interstate Waterways System barge facilities offer cheap transportation to industry.

There are seven nationwide or interconnecting bus lines that serve Sioux City:

B&B Transfer
Continental Trailways
Greyhound Lines
Sedalia Marshall-Booneville Stage Lines
Midwest Coaches
Inter-City Bus Lines
Sioux Lines

Three certified airlines provide air travel to Sioux City and they are as follows:

1. Braniff
2. North Central
3. Ozark

These airlines provide 27 flights daily and provide connection with air service to all parts of the world. An Air National Guard Jet-Equipped Squadron also bases at the Municipal Airport. In addition to the Municipal Airport Sioux City is served by Graham Flying Service of Graham Field in North Sioux City, South Dakota, and Sioux City Air Incorporated operating from Martin Field in South Sioux City, Nebraska.

Power:

Sioux City is served by the Iowa Public Service Company. This Utility Company is one of Iowa's largest investor-owned utilities. This system has a generating capacity of 415,000 KW and is interconnected with 161,000 V lines. These lines also connect with the United States Bureau of Reclamation System.

The Iowa Public Service also supplies gas to Sioux City which is purchased from the Great Northern Natural Gas Companies pipeline system. Sioux City is served by five major pipeline companies that carry a wide range of petroleum products. The pipelines are as follows:

1. The Great Lakes Pipeline Company
2. Mobil Oil Company
3. Northern Natural Gas Company
4. Mid-America Pipeline Company
5. Standard Oil Company

Sioux City has both ground and surface water resources available. The municipal supply is derived from 13 wells in the Dakota Sandstone and all these wells are pumped to reservoirs from which flows water by gravity. The capacity is 26,000,000 gallons per day.

COST OF WATER PER MONTH - 4" METER

Gallons	Water
100,000	49.87
500,000	145.87
1,000,000	265.87
2,000,000	505.87
5,000,000	1,225.87
10,000,000	2,425.87

Labor:

Sioux City's labor supply comes from a 30-40 mile radius which indicates that additional labor would be available for industry because most cities in the upper midwest draw labor from up to a 60 mile radius. The work force for the most part is healthy, intelligent, venturesome and independent, and conscientious. The job turnover is low and labor productivity is generally high.

DISTANCE FROM:

CHICAGO	492	KANSAS CITY	229	ST. LOUIS	524
OMAHA	96	MINNEAPOLIS	268	MILWAUKEE	491

COUNCIL BLUFFS

History:

The first white men to stop at the site of what is now Council Bluffs were Lewis and Clark who held a "council" with the Otoe and Missouri Indians. The name Council Bluffs comes from this meeting. In 1859 the city was selected by Abraham Lincoln as the eastern terminus of the first transcontinental railroad to be built in the United States.

Location:

Council Bluffs is located on the Iowa side of the Missouri River. It is located on the western edge of the State of Iowa at the intersection of Interstate Highway 29 and Interstate 80. The city ranks fifth in the nation as a rail center. Frontage on the Missouri River gives the town industry access to the Interstate Waterways System.

Transportation:

Eight major railroads provide excellent service to Council Bluffs. The daily freight service includes 16-19 east bound and 16-19 west bound daily. In addition all eight lines have reciprocal shipping, six on a 24-hour basis. Council Bluffs is served by the following railroads:

1. Burlington Roads
2. Union Pacific
3. The Milwaukee Road
4. Illinois Central
5. Northwestern
6. N & W
7. The Great Western
8. Rock Island

The town has five local freight terminals, and three passenger terminals.

Council Bluffs is ringed and crisscrossed with major highways. The following is a list of highways that junction in Council Bluffs:

Interstates

1. North-South - 29
2. East-West - 80, 280, 480

U. S. Highways

1. U. S. 30A, U. S. 6, U. S. 275, U. S. 75

State Highways

1. Iowa 64, Iowa 92, Iowa 192, Iowa 375

Council Bluffs has at least 44 intrastate and interstate carriers operating from 8 terminals in the area which provide service with direct connections to more than half of the states.

Shipping time to principal cities on a truck load basis.

Chicago - overnight	Los Angeles - 3 days
Denver - overnight	New York - 3 days
St. Louis - overnight	Boston - 3 days
Houston - 2 days	Detroit - 2 days

Three bus lines serve the area and are as follows:

1. Continental Trailways
2. Greyhound Lines
3. Davis Bus Line

Five scheduled airlines provide air service to Council Bluffs. These five airlines are as follows:

1. United
2. Braniff
3. Frontier
4. North Central
5. Ozark

Water is becoming increasingly important to industry as a low cost transportation. Council Bluffs is located on the Interstate Waterways System and is serviced by two barge lines which are Federal Barge Lines and the Sioux City and New Orleans Barge Line.

Shipping time to:

1. Kansas - 36 hrs.
2. St. Louis - 3.5 days
3. Cincinnati - 10 days
4. Minneapolis - 14 days
5. New Orleans - 10 days
6. Chicago - 9 days

Power:

The Iowa Power and Light Company, a privately owned electric utility, serves Council Bluffs. This utility has a capacity of a 140,000 K.V.A. and the current demand is 50,000 K.V.A. This leaves 90,000 K.V.A. available for expansion.

Rates: Monthly

Demand Charges:

$100.00	50 KW
1.50	50 KW
1.10	X

Reactive Demand Charges:

$0.20 per KVAR excess of 50% demand

Energy Charge:

1.5¢	50,000 KWH
1.2¢	150,000 KWH
1.0¢	X

The natural gas supply available to Council Bluffs is unlimited. The Peoples Natural Gas Company of Council Bluffs, a division of Northern Natural Gas Company, serves Council Bluffs. This company has a propane air mixing plant, which is kept in readiness for standby operation in any emergency.

NATURAL GAS RATES

Industrial gas contracts are drawn to suit each individual firm using the following rates as guide:

ALL RATES BASED ON CONSUMPTION REGISTERED AT ONE METER LOCATION

GENERAL SERVICE - DOMESTIC AND COMMERCIAL FIRM-EFFECTIVE DECEMBER 27, 1959

First	400 cu. ft.	$1.40 Minimum Bill
Next	600 cu. ft. @	.1250 per 100 cu. ft.
Next	1,000 cu. ft. @	.1150 per 100 cu. ft.
Next	1,000 cu. ft. @	.10 per 100 cu. ft.
Next	7,000 cu. ft. @	.0875 per 100 cu. ft.
Next	40,000 cu. ft. @	.0725 per 100 cu. ft.
Over	50,000 cu. ft. @	.07 per 100 cu. ft.

The above rates are net. An addition of 10% will be made on bills not paid within fifteen days from the date of billing. All gas bills are subject to the Iowa Sales Tax.

The Council Bluffs Municipal Water Company supplies water in nearly unlimited quantities. The Missouri River as well as several wells supply the water to Council Bluffs.

Total Volume Available

A - Raw Water	20,000,000 gal. per day
B - Filtered Water	17,000,000 gal. per day

The average daily consumption is only 7,000,000 gallons per day.

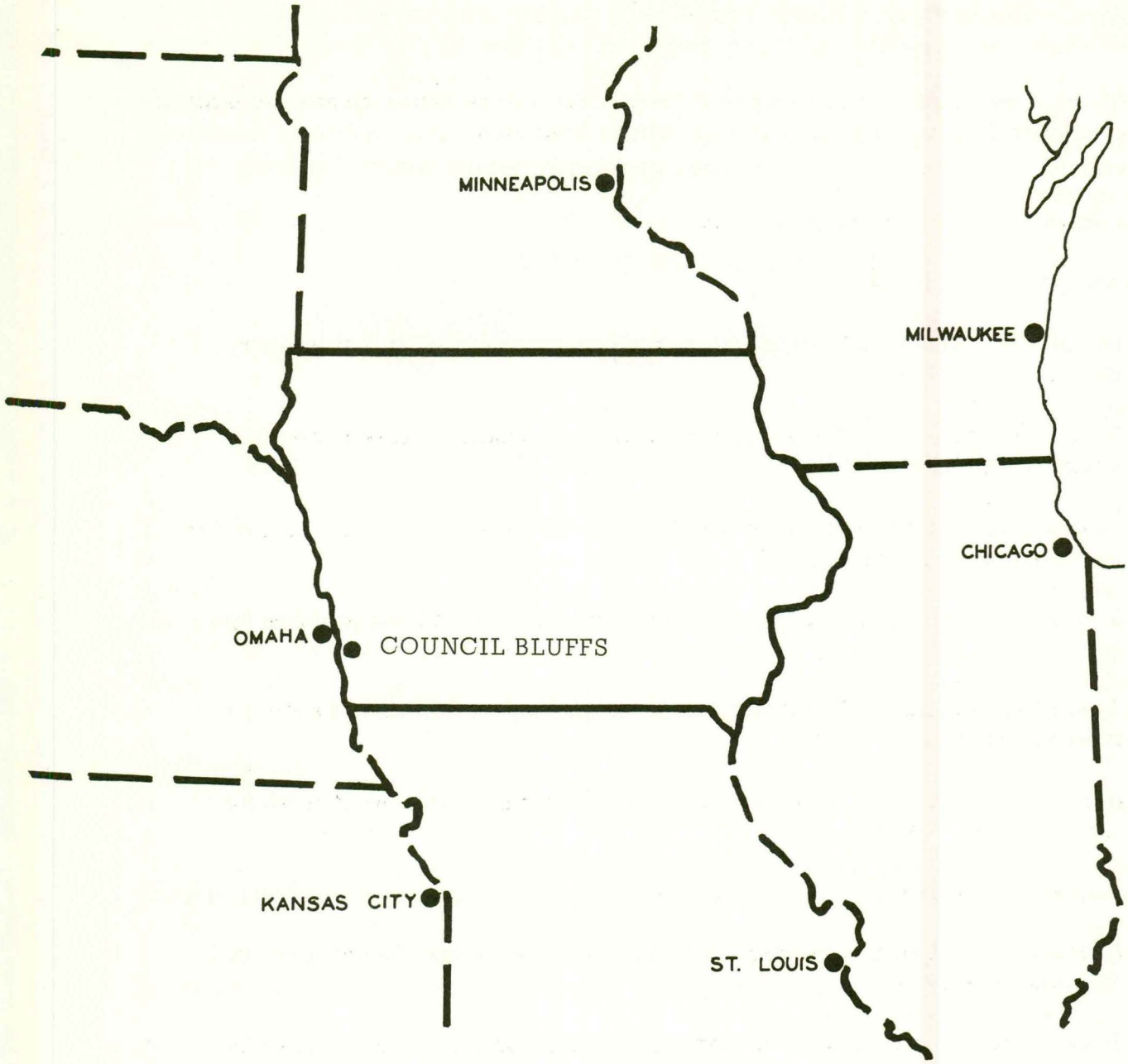
Labor:

Council Bluffs has a satisfactory labor supply which includes an excess of "off the farm supply". The labor supply has a high average educational level, a high literary rate, and a machinery and tool know-how. The State of Iowa also has the "right to work law". Seventy-five percent of the labor employed in manufacturing live in Council Bluffs, 15% within a 10 mile radius, 6% in a 20 mile radius, 3% in a 30 mile radium, and 1% beyond the 30 mile radius.

Sites:

Council Bluffs has over 2,000 acres lying along Interstate 80 and 29 that has been surveyed and programed for industry. The sites are within the city limits or adjacent to the city. All of these sites have access to water, gas, power utilities and rail. A 100 acre Industrial Park has been developed with rail, streets, and all utilities. In addition six Industrial Districts are now under planning and preliminary development.

The Council Bluffs Industrial Foundation, a non-profit corporation, has $328,000 available. This includes funds invested in land, and development costs.



DISTANCE FROM:

CHICAGO	476	KANSAS CITY	204	ST. LOUIS	456
OMAHA	7	MINNEAPOLIS	365	MILWAUKEE	480

APPENDIX

The terminology used in this report is comparable to the terms commonly used by the Forest Service in publishing Forest Survey releases.

Forest Resources of Iowa original survey - 1953

Northeastern Subregion

Board foot volume in Northeastern Iowa on commercial forest area by Ownership - 1953

Board foot volume in Northeastern Iowa on commercial forest area by species - 1953

Cubic foot volume of growing stock in Northeastern Iowa on commercial forest area by species - 1953

Board foot volume in Northeastern Iowa on commercial forest area by log grade - 1953

Board foot volume in Northeastern Iowa on commercial forest area by tree diameter class - 1953

Board foot volume in Northeastern Iowa on commercial forest area by forest types - 1953

Southeastern Subregion

Board foot volume in Southeastern Iowa on commercial forest area by Ownership - 1953

Board foot volume in Southeastern Iowa on commercial forest area by species - 1953

Cubic foot volume of growing stock in Southeastern Iowa on commercial forest area by species - 1953

Board foot volume in Southeastern Iowa on commercial forest area by log grade - 1953

Board foot volume in Southeastern Iowa on commercial forest area by tree diameter class - 1953

Board foot volume in Southeastern Iowa on commercial forest area by forest types - 1953

Western Subregion

Board foot volume in Western Iowa on commercial forest area by Ownership - 1953

Board foot volume in Western Iowa on commercial forest area by species - 1953

Cubic foot volume of growing stock in Western Iowa on commercial forest area by species - 1953

Board foot volume in Western Iowa on commercial forest area by log grade - 1953

Board foot volume in Western Iowa on commercial forest area by tree diameter class - 1953

Board foot volume in Western Iowa on commercial forest area by forest types - 1953