

**KANSAS GEOLOGICAL SURVEY
OPEN-FILE REPORT 64-2**

**MINERAL RESOURCES INVENTORY—
SOUTH-CENTRAL KANSAS**

by

Ronald Hardy

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Kansas Geological Survey
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Lawrence, KS 66047-3726

KGS
OF
64-2

February 18, 1964

Mr. Leslie Frazier
Cooperative Extension Service
Area Extension Specialist
District Extension Office
Fairgrounds
Hutchinson, Kansas 67501

Dear Mr. Frazier:

We have summarized the principal known non-metallic minerals in the counties that you have listed, exclusive of gas and oil. We have included a few comments on some of the major points in connection with these materials. In addition to what is included in this report, comments from the Ellsworth meeting would apply to most of these materials.

I have, also, included a summary on the raw material situation for the U.S. as projected to the year 2000. I find this interesting in connection with some of the raw materials or processes that might be developed in our state.

Please accept our apologies for being a bit late in getting this material to you.

Very truly yours,

Ronald G. Hardy
Mineral Resources Division

RGH:ls
cc: W. H. Hambleton

RAW MATERIALS: WILL U. S. HAVE ENOUGH IN 2000?

Newly completed study examines demand for and supply of natural resources—their products and uses as well as the basic land, water and minerals—through the end of the twentieth century.

The U.S. has ample natural resources to support a sustained economic growth between 1960 and 2000, provided that:

- Technological advances and their economic adaptation continue.

- Foreign sources of raw materials remain open through a viable world trading and investing system.

- Government resource policies and private management of resource enterprises improve in far-sightedness, flexibility and consistency.

These are some principal conclusions reached by Resources for the Future, Inc., a Washington, D. C., nonprofit corporation supported by the Ford Foundation, which has completed a broad inquiry into the outlook for U.S. natural resources over the remainder of the twentieth century.

Capping more than five years of research, the study has just been published in a 1,056-page book,* divided more or less equally between text and supporting appendix tables. The crucial question it tries to answer is not simply how much of resources there will be, but what it will cost to produce the needed resource materials and services most efficiently.

► **Haves and Have-Nots**—Regarding chemicals manufacture, the report points out that most of this industry is based on raw materials that do not appear to face depletion in the time span of the study. Of the nonmetallic nonfuel miner-

als, only sulfur is a candidate for a moderate measure of concern.

Petrochemicals are not likely to significantly affect the over-all demand for oil and gas, despite a 6% annual growth rate for the first 20 years of the study and a 4.5% figure for the remainder. The share that these chemicals now claim is so small that even big growth rates will leave it small in the future.

Total demand for energy is expected to triple by the end of the century. After 1980, energy-supply problems may arise in oil and gas.

Domestic requirements for major metals are expected to grow much faster than population during the rest of the century, though generally not so fast as gross national product. Many metals will present problems of future adequacy.

► **Escape Hatch: Technology**—A need is revealed clearly at many points in the study for continued gains in technology—gains without which the ever-present tendencies for demand to outrun supply cannot be held in check.

For example, continued advance

Some Projected Indexes of U. S. Industrial Production *

(For each category, 1957 = 100)

	1960	1980	2000
Over-all U. S. industry.....	108.0	249	564
Chemical, petroleum, plastic and rubber products—total	117.7	283	624
Chemicals and chemical products.....	121.2	294	642
Industrial chemicals.....	126.8	348	778
Drugs, soaps and toiletries.....	118.4	267	530
Paints.....	102.5	115	191
Fertilizers.....	114.8	209	333
Petroleum products.....	108.1	185	342
Plastic and rubber products.....	114.3	342	843
Primary metals.....	90.3	168	303
Clay, stone and glass products.....	109.6	233	488
Pulp and paper.....	111.9	232	450
Coal.....	82.6	120	135
Crude oil and natural gas.....	98.5	173	321

* Original sources: Federal Reserve Board.

Manufacturing Requirements for Key Organic Chemicals

(Million pounds)

	1960	1980	2000
Acetylene.....	640	2,230	4,810
Adipic acid.....	290	820	1,330
Butadiene.....	1,920	4,550	7,500
Ethylene (99+%).....	1,310	4,820	11,320
Ethylene dichloride.....	770	2,830	6,670
Formaldehyde (37% basis).....	1,750	5,680	14,810
Phenol.....	370	970	2,340
Phthalic anhydride.....	380	750	1,630
Propylene (99+%).....	150	3,080	11,880
Styrene.....	1,730	4,970	11,470

* "Resources in America's Future," by H. H. Landsberg, L. L. Fischman and J. L. Fisher, The Johns Hopkins Press, Baltimore.

in techniques for exploration, extraction and processing of ores, plus better efficiency in getting heat and power from fuels, will certainly be necessary to satisfy demands for mineral materials and energy. And by the last two decades of the century, nuclear power and liquid oil from shales and tar sands will probably have to make significant contributions to the energy picture.

Reuse of water within industries, improvements in pollution treatment and many similar adaptations of new water technology—perhaps even a significant contribution from water desalting—will be called on.

► **And Free Trade**—In 1948, the

U.S. for the first time became a net importer of oil, and shortly afterwards of iron ore. It is clear that in the future even larger amounts of certain items, especially among the minerals, will have to be drawn from foreign sources if demand is to be satisfied without marked increase in cost.

U.S. policies regarding imports and treatment of foreign investments should strike their compromises with these factors in view.

► **Chemicals**—The authors of the report did not develop detailed demand estimates for many segments of the chemical industry.

In the first place, they noted that chemical raw-material sources tend

to change speedily. And, to the extent that the chemical industry's basic sources are salt, lime, phosphate and potash, the known U.S. deposits are so vast as not to raise question of even moderate cost increase due to their depletion.

Phosphates provide an example. Domestic use of phosphates for fertilizer alone can be projected to rise from 3 million tons in 1960 to nearly 9 million tons in 2000. Adding the requirements for other uses, and providing for continuous export at current rates, would result in a cumulative call on phosphate reserves of just under 400 million tons. However, Florida alone has 50% in excess of the reserves needed to meet this, and the Western reserves themselves are twice as large as the demand.

Potash use has been rising faster than phosphate, and therefore the study assumes a quadrupling of aggregate consumption. The cumulative demand would be almost 200 million tons (measured in K_2O content) for the 40-year period—equivalent to only half of the recoverable U.S. reserves.

But sulfur presents a different outlook. Cumulative domestic demand during the 40-year period, totaling 600 million tons (30 million tons/yr. by 2000), cannot be satisfied by presently identified reserves in the U.S.

The study discloses considerable information on the basic materials for plastics, synthetic fibers and rubber (see tables). A combined growth of 230% in these categories is expected between 1960 and 1980, and of 150% from 1980 to 2000. For the entire 40-year period, the compounded rate of growth comes out to be 5.3%/yr. This over-all rate is made up of a vast range of rates in the individual components.

► **Energy**—It appears that, at least through the 1970's, energy needs can be met at no significant increase in real cost, and with no sweeping changes in the relative contributions of oil, natural gas and coal. But toward the end of the century, the patterns may change due to the rising importance

Consumption of Synthetic Resin Materials

(Million pounds)

	1960	1980	2000
Phenolic and other tar acid resins.....	651	1,700	4,100
Alkyd resins.....	552	527	906
Styrene resins.....	1,062	3,810	10,310
Polyester resins.....	190	1,390	4,000
Polyolefins.....	1,337	6,960	20,040
Urea and melamine resins.....	399	1,119	2,431
Vinyl and vinyl copolymer resins.....	1,203	4,660	11,330
Coumarone-indene and petroleum polymer resins.....	265	504	1,180
Other resins.....	479	3,490	11,700

Demands for Energy

	1960	1980	2000
Petroleum, million bbl.....	3,190	5,340	10,030
Natural gas, billion cu. ft.....	12,870	23,470	32,780
Natural gas liquids, million bbl.....	340	750	1,560
Coal, million tons.....	436	620	718
Hydroelectric power, billion kwh.....	149	283	363
Nuclear power, billion kwh.....	...	400	2,400

Consumption of Principal Metals

(Million tons)

	1960	1980	2000
Iron and steel.....	72	121	194
Aluminum.....	1.6	5.6	14.7
Copper.....	1.8	3.6	6.8
Zinc.....	0.9	1.8	3.4

of nuclear energy and a decline in the relative importance of oil and gas (see table).

Assuming a future import level to be 20% of demand, cumulative requirements for domestic petroleum are calculated at about 185 billion bbl. between 1960 and 2000, with total demand at about 10 billion bbl. in the year 2000 itself. Adding a minimum reasonable level of reserves to support such production gives a figure in the neighborhood of 260 billion bbl. Based on certain logical assumptions, such an amount promises to exceed the aggregate oil supplies that may be recovered in the future.

By 2000, annual demand for natural gas would normally rise to 33 trillion cu. ft.—well above the 22 trillion cu. ft. that many experts have estimated to be the peak of future gas production in this country. Production must be expected to level off many years before the end of the century, though apparently not before 1980.

► **Metals**—There are likely to be some significant changes over the next 40 years in the pattern of metals use (see table). Projected substitution of aluminum for steel in motor vehicles, containers and construction materials is the reason for the most striking of these.

The extent of the change is brought out most sharply when one compares the major metals in terms of volume rather than tonnage. On this basis, iron and steel accounted for 90% of metal volume in 1960, vs. 5.6% for aluminum. By 1980, these figures are expected to have shifted to 84.5% and 11.2%, respectively, and by 2000 to 79% and 17%.

Cumulative demand for iron and steel through the end of the century exceeds currently identified domestic reserves of iron ore by some 40%. Domestic reserves of manganese are just about equivalent to one year's consumption at present rates of steel production.

Bauxite reserves are equivalent to some five years of production at present rates; basically, the country holds a have-not status. Identified reserves of copper equal not quite half of the projected cumulative requirements. Lead reserves

are little more than 10% of projected demand; zinc reserves come to nearly one-third. Among the ferroalloy materials, domestic reserves appear sufficient only in the case of molybdenum.—FA

Europe May Face a Uranium Shortage

The European atomic energy organization, Euratom, has been warned by its supply agency that after 1970 rapid expansion of atomic energy facilities will lead to a shortage of nuclear fuel and a sharp jump in the price of natural uranium—and that the organization should start doing something about it now.

The supply agency predicts that between 1970 and 1980 nuclear-power capacity in the Free World will increase by 106,000 electrical megawatts. Of this, 30,000 megawatts will be installed in the Com-

mon Market countries (West Germany, France, Italy, Belgium, Netherlands, and Luxembourg), which are also Euratom's six member-countries.

Correspondingly demand for natural uranium will climb from about 9,000 tons/yr. in 1970 to 35,000-50,000 tons/yr in 1980, creating a supply shortage that could drive prices up to as high as \$9/lb. of uranium oxide content by 1975 (vs. about \$4/lb. now).

The agency accordingly advises Euratom to begin stockpiling natural uranium at present prices; to invest in uranium mines that are now inactive because of overproduction; to engage in prospecting operations within—or even outside of—the Common Market; and to substantially step up its breeder reactor program.

Last year, U. S. experts came up with similar conclusions. But they anticipated that a swell in U. S. uranium demand may not come until the mid- or late 1970's (*Chem. Eng.*, May 14, 1962, p. 92).

McGraw-Hill's Dept. of Economics takes a look at . . .

WHAT'S AHEAD FOR BUSINESS? Corporate profits for the final quarter of last year may have reached a record level. According to preliminary calculations, they may come close to an annual rate of \$54 billion—up by possibly \$3 billion from the level for the preceding three-month period, and also up by nearly \$3 billion from the peak level for the final quarter of 1961, when a rapidly expanding output gave profits a boost.

A rise in profits now could be just the plus-factor needed to get the economy moving through 1963 at a more satisfactory pace than it has demonstrated in this first portion of the year. If corporations are presented with profitable investment opportunities, chances are excellent for a significantly stepped-up volume of expenditures for new plant and equipment. The profit rise may also be the first concrete indication for the economy as a whole that manufacturers' intensive emphasis on cost-cutting investment in recent years is actually paying off in a big way.

The economy's major underpinnings, meanwhile, remain strong. Barring a hitch in the labor outlook, steel appears likely to do about the same volume of business as it did in 1962. A possible weak spot is the automobile industry: although auto sales in the early weeks of 1963 have remained good, the odds still appear to be against a repetition of last year, the industry's best since 1955. A 6.6-million-unit sales year—compared with 7.1 million in 1962—is probably the best we can expect in 1963. In contrast, chemicals, appliances, construction and other key industries seem likely to score additional gains in 1963, helping to overcome reductions in total business volume that lower auto sales could bring about.

PRINCIPAL MINERAL RESOURCES OF ELLSWORTH COUNTY
(OTHER THAN OIL & GAS)

<u>MINERAL</u>	<u>GENERAL RESERVE ESTIMATE</u>
1) Salt	Large
2) Clays	Large
3) Sand & Gravel	Limited
4) Limestone	Limited
5) Lignite	Limited
6) Volcanic Ash	Limited
7) Water	Limited

PRINCIPAL MINERAL RESOURCES OF BARTON COUNTY
(OTHER THAN OIL & GAS)

<u>MINERAL</u>	<u>GENERAL RESERVE ESTIMATE</u>
1) Clays	Large
2) Limestone	Limited
3) Salt	Large
4) Sand and Gravel	Large

PRINCIPAL MINERAL RESOURCES OF RICE COUNTY
(OTHER THAN OIL & GAS)

<u>MINERAL</u>	<u>GENERAL RESERVE ESTIMATE</u>
1) Clays	Limited
2) Dolomite	Limited
3) Salt	Large
4) Shales - Lt. wt. aggregate	Large
5) Sand and Gravel	Large
6) Limestone	Limited

PRINCIPAL MINERAL RESOURCES OF RENO COUNTY
(OTHER THAN OIL & GAS)

<u>MINERAL</u>	<u>GENERAL RESERVE ESTIMATE</u>
1) Permian Shales	Large
2) Dolomite	Limited
3) Sand and Gravel	Large
4) Salt	Large
5) Volcanic Ash	Very Limited

PRINCIPAL MINERAL RESOURCES OF STAFFORD COUNTY
(OTHER THAN OIL & GAS)

MINERAL

RESERVE ESTIMATE

1) Volcanic Ash

Very Limited

2) Sand and Gravel

Large

3) Salt

Large

PRINCIPAL MINERAL RESOURCES OF SUMNER COUNTY
(OTHER THAN OIL & GAS)

<u>MINERAL</u>	<u>GENERAL RESERVE ESTIMATE</u>
1) Sand and Gravel	Large
2) Permian Shales	Unlimited
3) Limestone	Limited
4) Salt	Large
5) Gypsum	Large

PRINCIPAL MINERAL RESOURCES OF HARPER COUNTY
(OTHER THAN OIL & GAS)

<u>MINERAL</u>	<u>GENERAL RESERVE ESTIMATE</u>
1) Volcanic Ash	Large
2) Sand and Gravel	Large
3) Salt	Large
4) Ninescah Shale	Large

PRINCIPAL MINERAL RESOURCES OF HARVEY COUNTY
(OTHER THAN OIL & GAS)

MINERAL

GENERAL
RESERVE ESTIMATE

1) Salt

Large

2) Sand and Gravel

Large

PRINCIPAL MINERAL RESOURCES OF KINGMAN COUNTY
(OTHER THAN OIL & GAS)

<u>MINERAL</u>	<u>GENERAL RESERVE ESTIMATE</u>
1) Sand and Gravel	Large
2) Helium	Limited
3) Salt	Large
4) Volcanic Ash	Limited
5) Dolomite	Limited
6) Some Shale	Questionable

PRINCIPAL MINERAL RESOURCES OF MCPHERSON COUNTY
(OTHER THAN OIL & GAS)

<u>MINERAL</u>	<u>GENERAL RESERVE ESTIMATE</u>
1) Sand and Gravel	Large
2) Salt	Large
3) Volcanic Ash - substantial	Large
4) Limestone - limited	Limited
5) Clays - limited but good	Limited
6) Shales	Large
7) Bentonite - like clays, possibility	
8) Sandstone	Large
9) Quartzite Rock	Limited

PRINCIPAL MINERAL RESOURCES OF PRATT COUNTY
(OTHER THAN OIL & GAS)

<u>MINERAL</u>	<u>GENERAL RESERVE ESTIMATE</u>
1) Volcanic Ash	Large
2) Salt	Large
3) Sand and Gravel	Large
4) Sandstone - S.W. Corner (SiO ₂)	Limited

BRIEF COMMENTARY ON SELECTED NON-METALLIC
MATERIALS AVAILABLE IN KANSAS

1) The clays of Ellsworth, Barton and McPherson counties are useful for ceramic processing into structural materials, because of light fired colors, such as brick or floor and wall tile. By beneficiation the indications are that these clays could be utilized as refractory clays. The better clays, i. e., high alumina, white or light colored ones, freedom from impurities, etc., could possibly be adopted for "filler" materials or as carriers for insecticides, fungicides and related toxicants. These latter industries consume the major portion of the clays in the U.S.

2) Volcanic ash has been used as a mild abrasive in soaps and scouring powders for many years; a use which has been largely supplanted by detergents. A list of potential uses is given on the accompanying table.

Recent developments at the Kansas Geological Survey have revived interest in volcanic ash as an insulating material. A simple heating process will cause the material to bloat into very light, non-combustible microscopic bubbles. Further treatments will produce a product that makes a good filter aid for filtering processes in dry cleaning, industrial applications and for swimming pools.

3) Salt underlies all or parts of these counties. The following chart lists the major present-day uses of salt in the U.S. The chloride industry is a complex one, and markets are sometimes elusive; a strong industry in this general area requiring large quantities of chloride chemicals would be of great value.

4) Shales where they are present are of little value other than for red brick or possibly light-weight aggregate. Present construction market strength does not encourage use of these materials for this purpose. A sewer pipe industry utilizing shales that could tap western Kansas and northern Oklahoma might be worth investigation.

5) Dolomite in addition to use as aggregate is a source of magnesium; however, present domestic technology uses largely sea water as a source of magnesium.

There has been a tremendous increase in the use of magnesia refractories in the iron and steel industry due to new oxygen processes for producing metal. A market does exist for lower cost supplies of magnesium compounds.

6) There is a potential market for a silica sand prepared in Kansas. Most sands currently being produced contain too many impurities to be easily beneficiated. There is a possibility that such material is present in extreme southwestern Pratt county. Good silica sand is in demand for glass and sodium silicate manufacture.

C L A Y S

KAOLIN

SOLD OR USED IN THE U.S. IN 1961

Per Cent Distribution By Use, Exclusive of
Heavy Clay Products, Cements, Stoneware, and Artware

<u>TOTAL TONS</u>	<u>2,674,262</u>
Whiteware	4.5%
Floor & Wall Tile	0.5
Fire Brick	9.1
Other Refractories	2.9
Fillers	
Paper (Filling & Coating)	54.5
Rubber	12.2
Insecticides & Fungicides	1.0
Paint	2.0
Other	4.6
Miscellaneous	8.6

Minerals Yearbook, 1961: U.S.B.M.: Clay Sold or Used by
Producers in the U.S., p. 458.

C L A Y S

BALL CLAY

SOLD OR USED IN THE U.S. IN 1961

Per Cent Distribution By Use, Exclusive of
Heavy Clay Products

<u>TOTAL TONS</u>	<u>395,253</u>	
Whiteware		59.5%
Floor & Wall Tile		23.4
Refractories		11.3
Fillers		1.2
Miscellaneous		4.6

C L A Y S

FIRECLAY
SOLD OR USED IN THE U.S. IN 1961

Per Cent Distribution By Use, Exclusive of Heavy Clay Products,
Terracotta, Stoneware, Art Pottery and Cements

<u>TOTAL TONS</u>	<u>4,495,883</u>	
Floor & Wall Tile		2.4%
Firebrick & Block		74.5
Foundries & Steel Works		10.3
Fireclay Mortars		1.7
Total Other Refractories		8.9
Fillers		0.4
Miscellaneous		1.8

VOLCANIC ASH

Use Distribution

AS MINED:

Scouring Compounds

Abrasives

Insecticides (Diluent)

Soil Conditioning

Highway Surfacing

Ceramic Flux

Puzzalon

Catalyst Carrier

Filler for Paints, Plastics, Paper, Rubber

Bloated

Filter Aids

Loose Insulation

Preformed Insulating Shapes

Greenhouses (Potting)

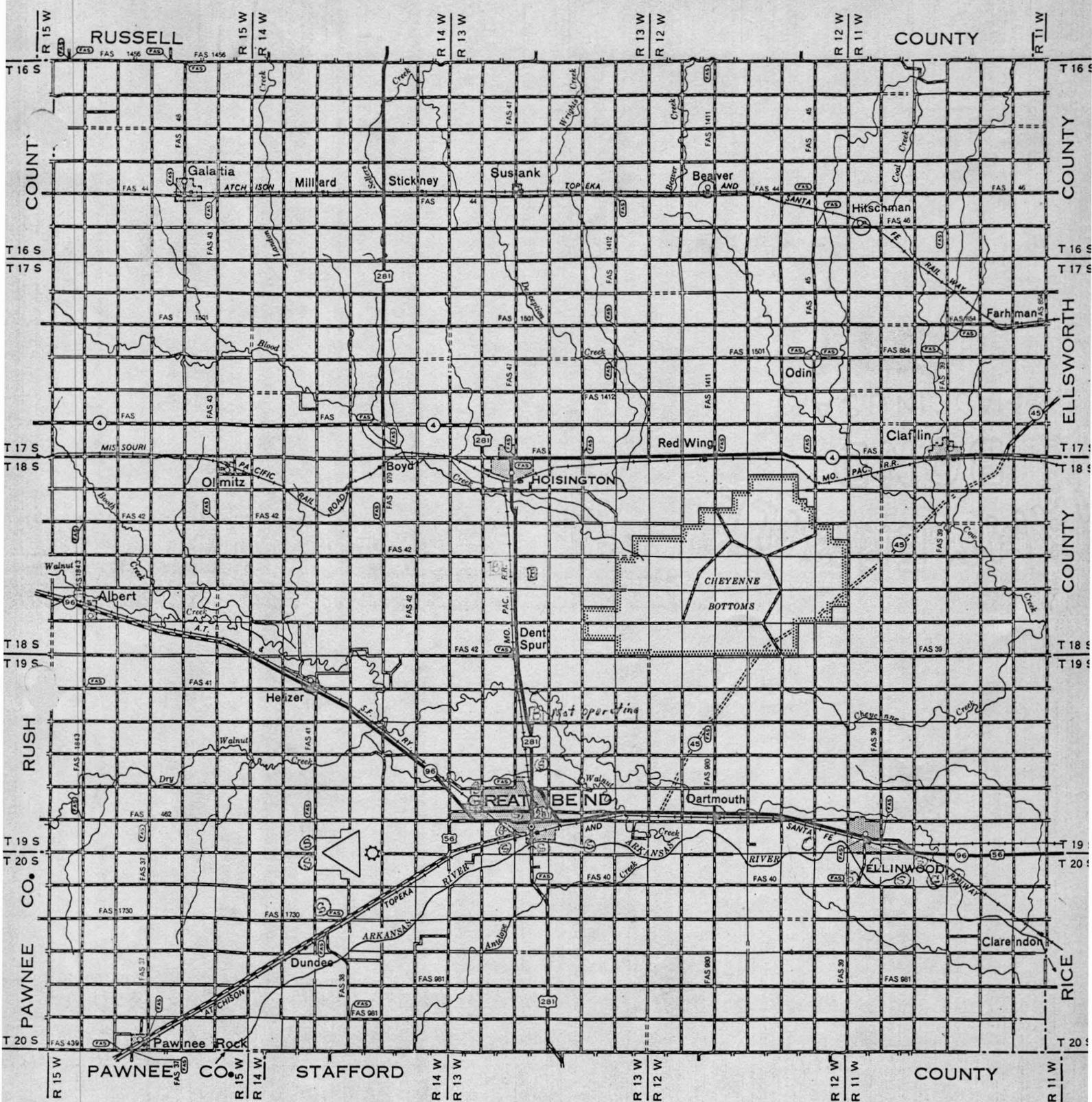
Plant Nutrient

SALT

Per Cent Distribution By Use

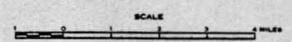
KANSAS 1961	
913,000 Tons	Value \$ 11,400,000
U.S. TOTAL	
25,707,000 Tons	" \$160,223,000

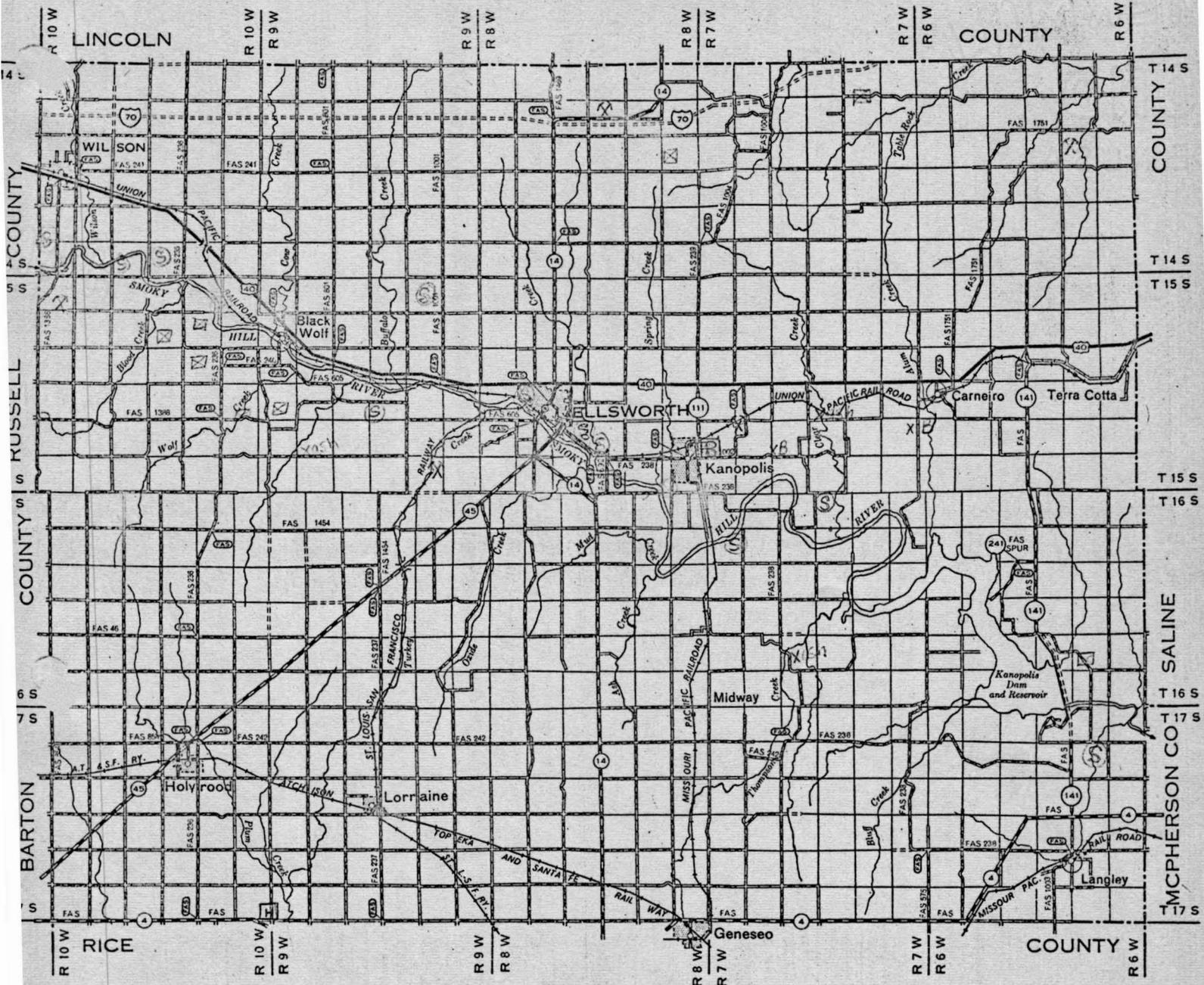
<u>USE</u>	<u>PER CENT</u>
Chlorine	38.8
Soda Ash	22.4
Soap	0.14
All Other Chemicals	5.2
Textile & Dyeing	0.77
Meatpacking	3.0
Fishing	0.12
Dairy	0.35
Canning	0.95
Baking	0.42
Flour Processors	0.19
Other Food	0.38
Ice Companies	0.23
Feed Dealers	3.80
Feed Mixers	1.3
Metals	0.50
Ceramics	0.05
Rubber	0.46



BARTON COUNTY KANSAS

1961

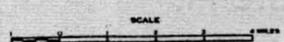


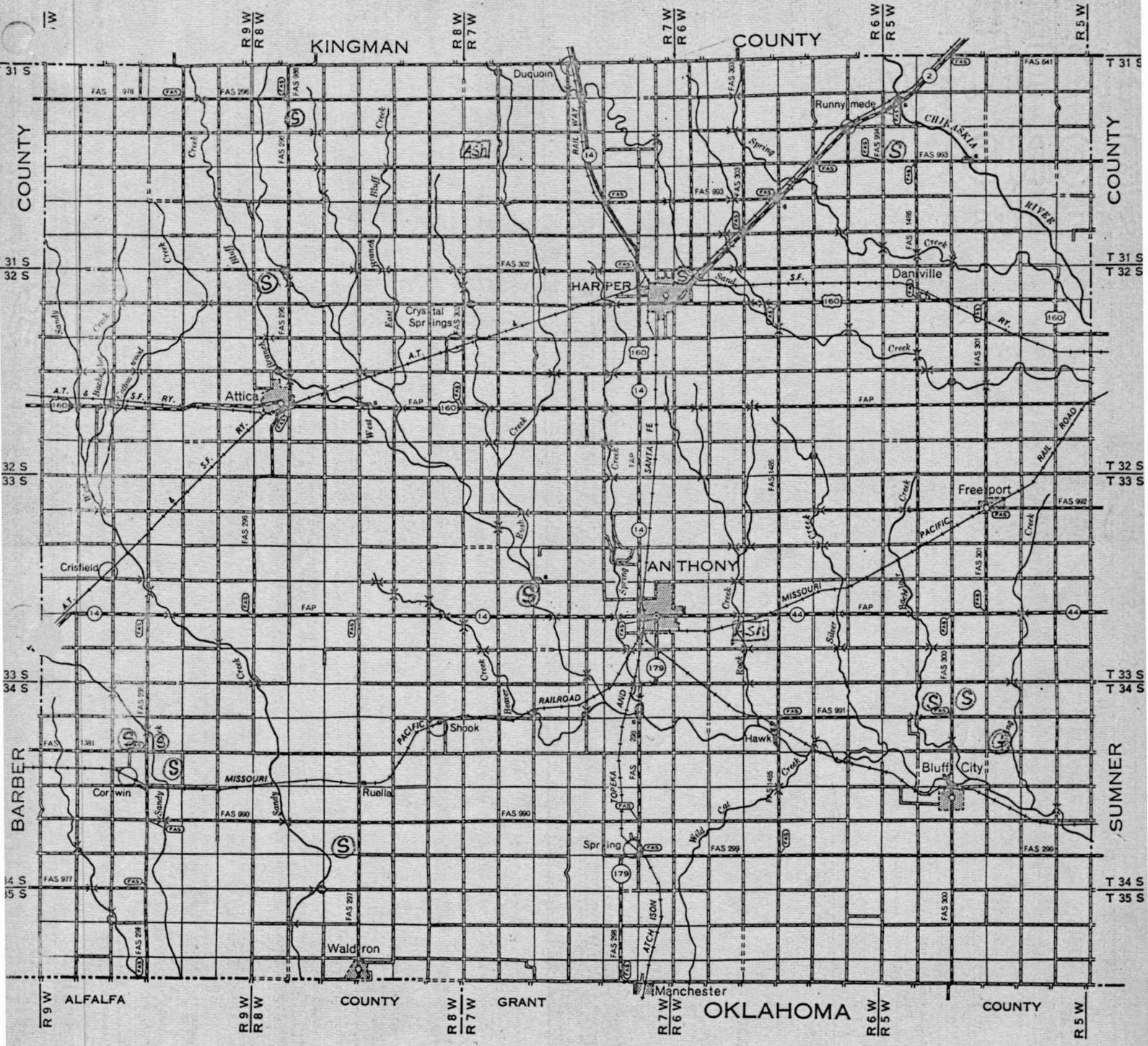


ELLSWORTH COUNTY KANSAS

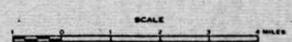


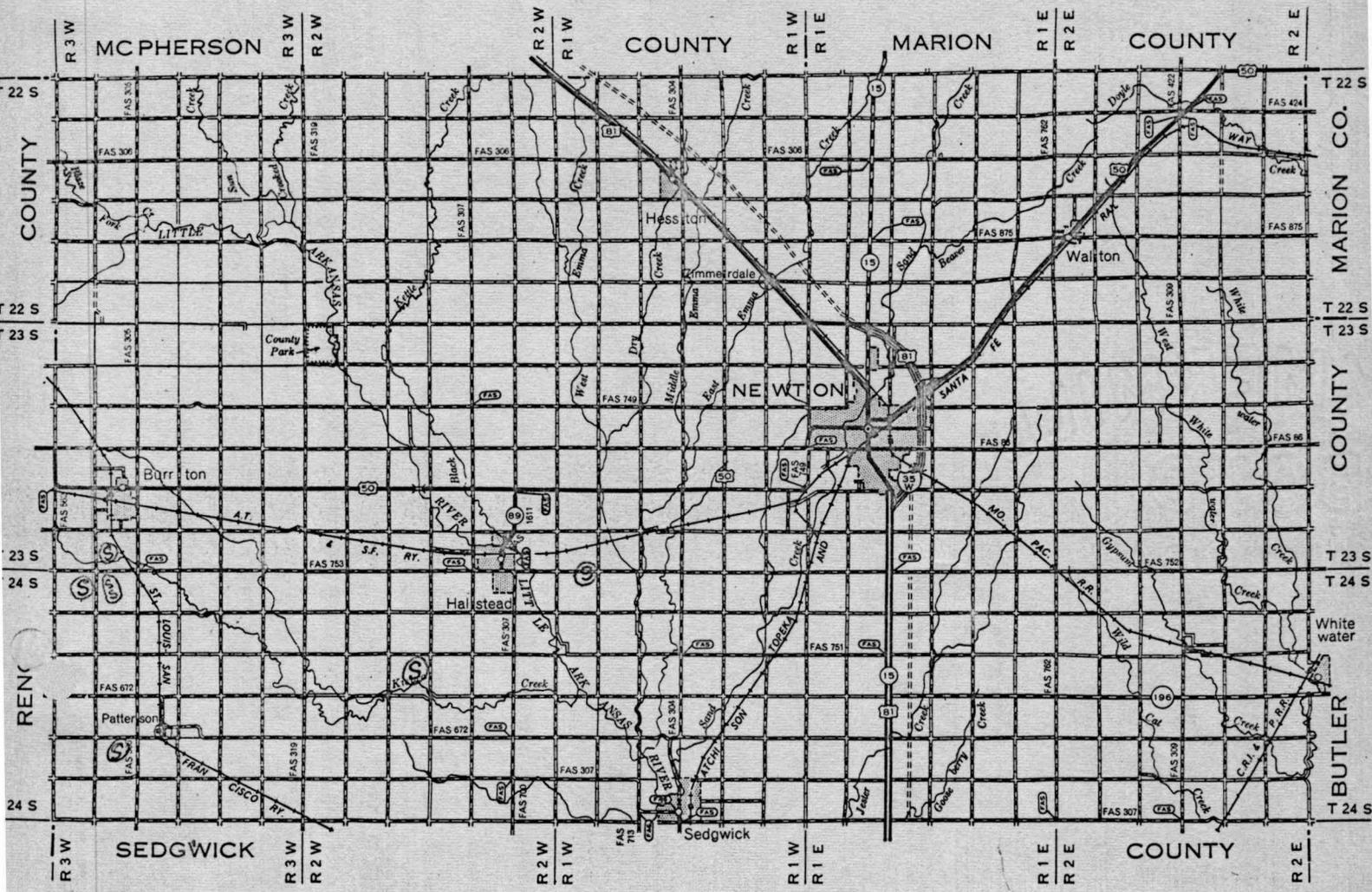
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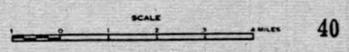
HARPER COUNTY KANSAS

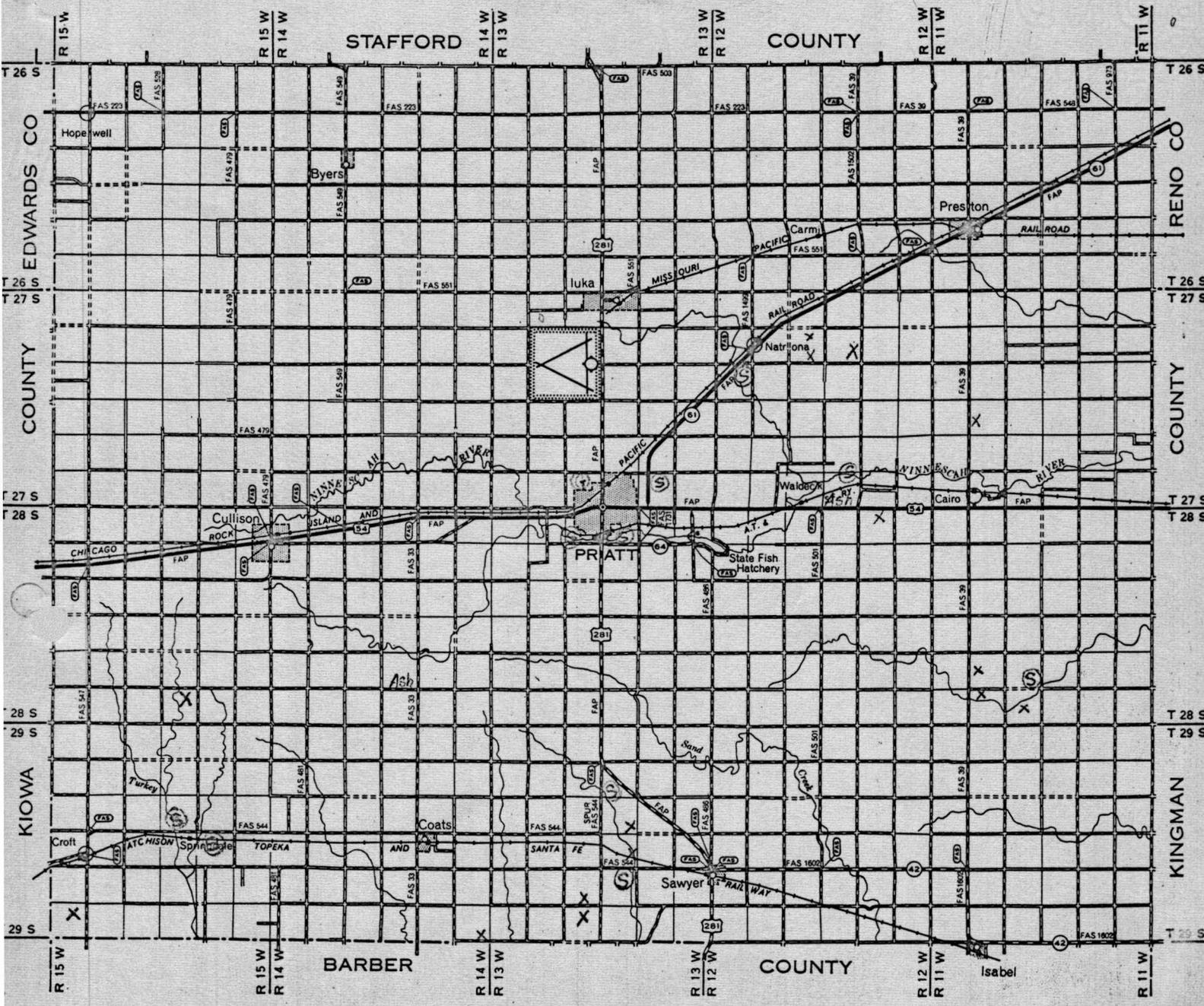




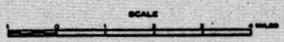
HARVEY COUNTY KANSAS

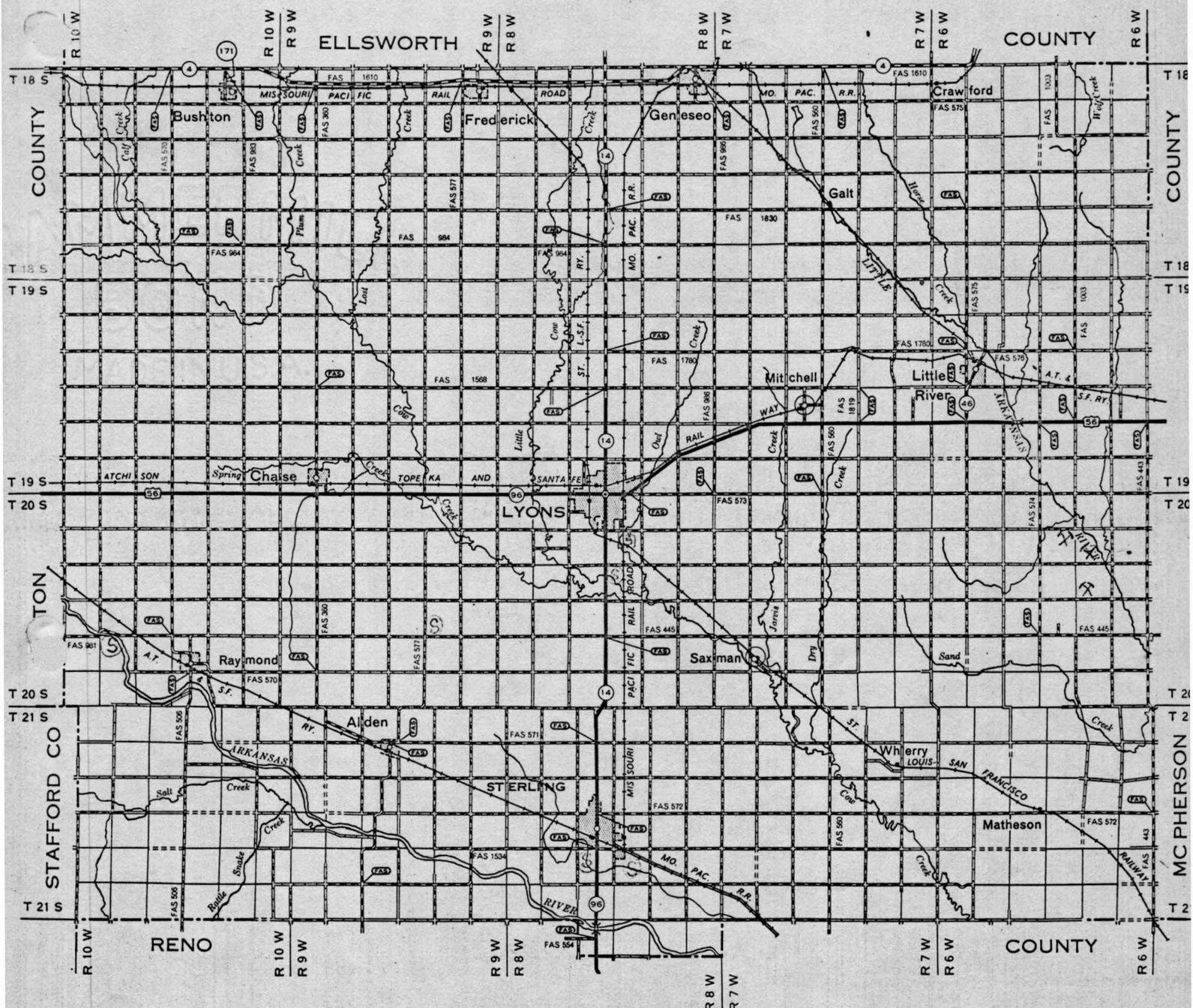
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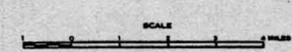
PRATT COUNTY
KANSAS

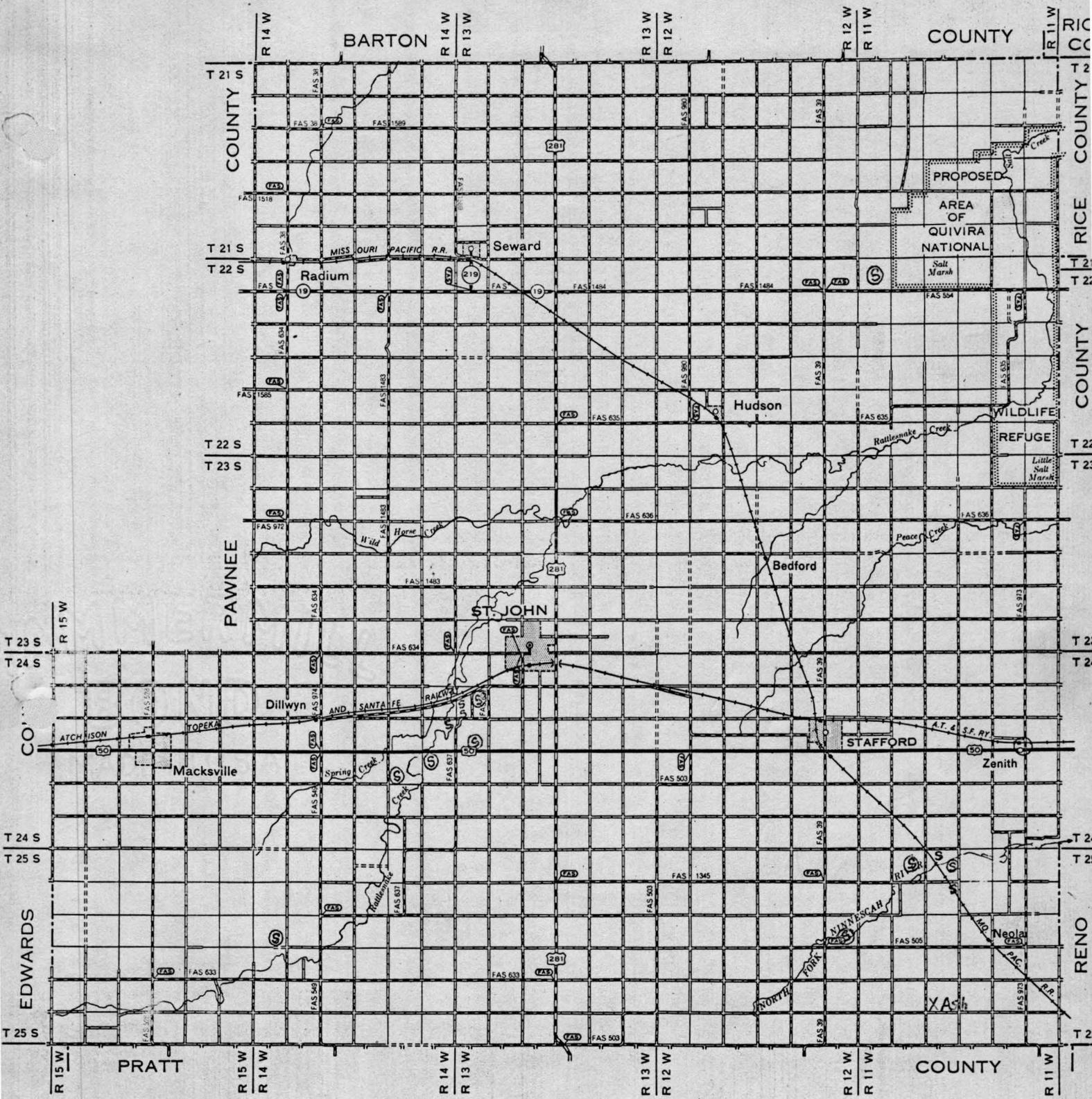





RICE COUNTY
KANSAS

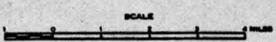
1959

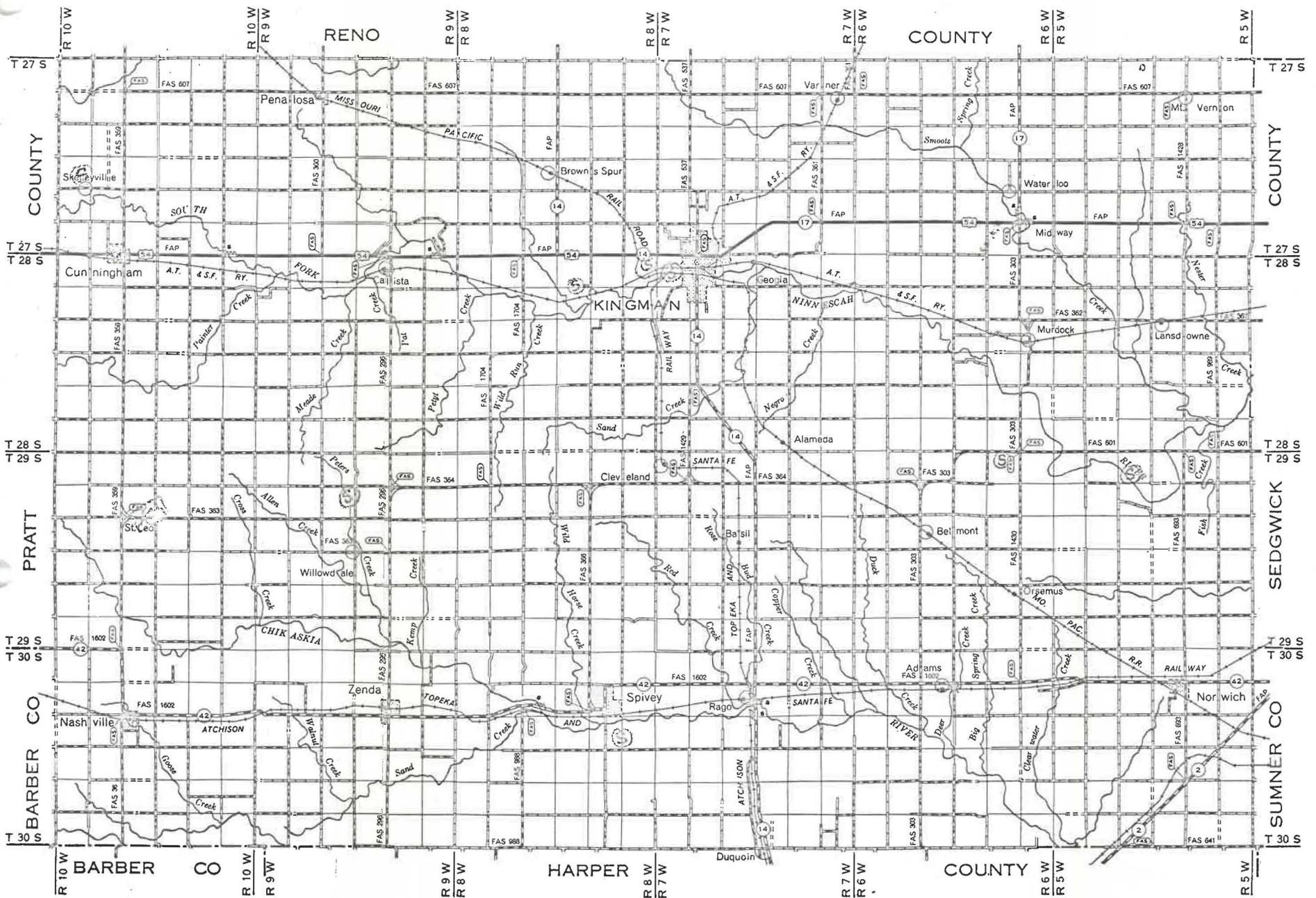




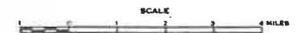
STAFFORD COUNTY KANSAS

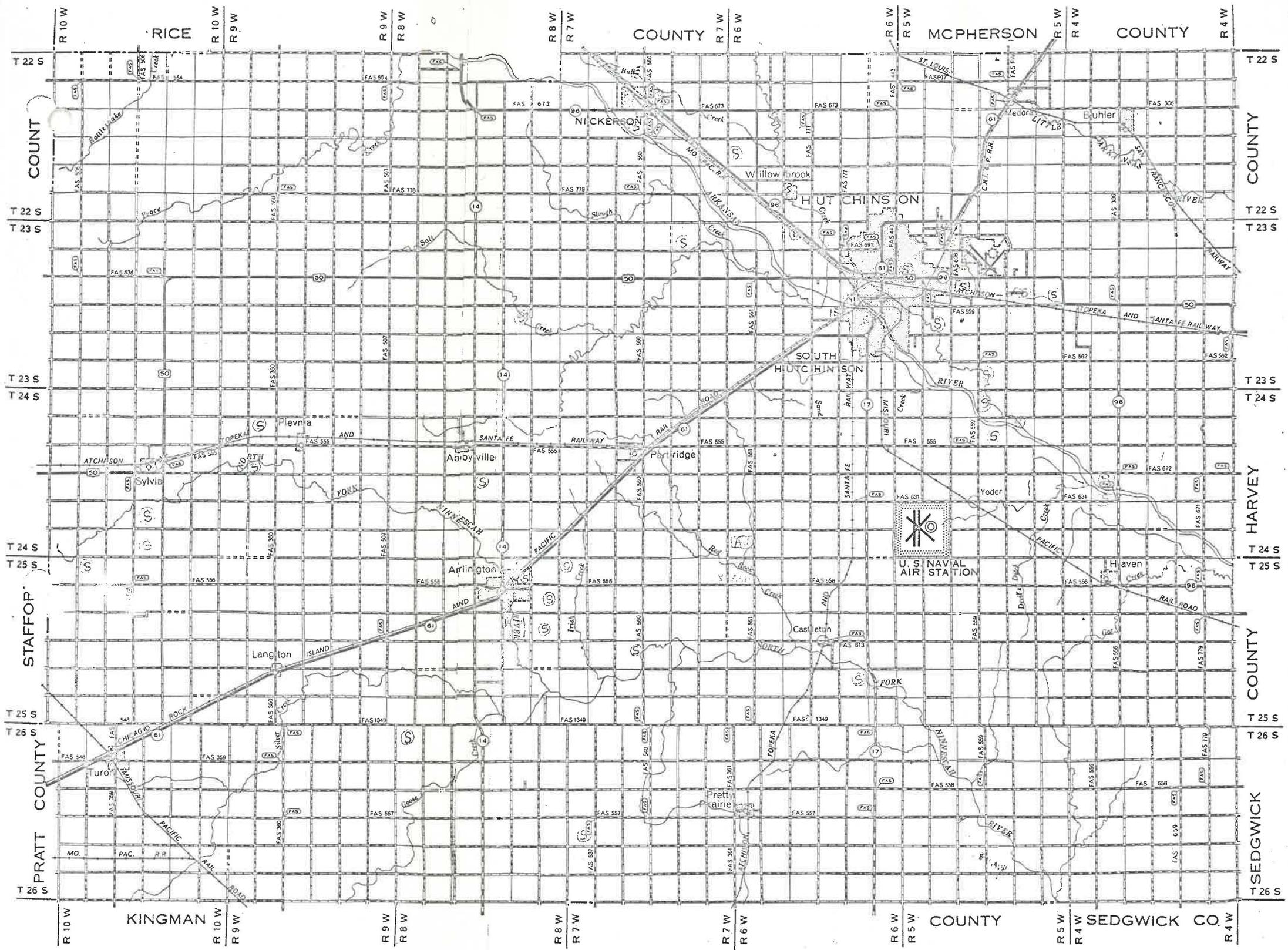
1961





KINGMAN COUNTY
 KANSAS





RENO COUNTY

KANSAS

