UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

ANALYTICAL DATA FOR BITUMINOUS COALS AND ASSOCIATED ROCKS FROM ARKANSAS, IOWA, KANSAS, MISSOURI, NEBRASKA, AND OKLAHOMA

by

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Open-File Report 90-669
1990

ABSTRACT

Chemical and descriptive data are presented for 60 coal and 15 rock samples collected in five of the six states in the Western Region of the Interior Coal Province. The information presented here has not previously been published. Data include sample locations, sampling methods, stratigraphic information, air-drying loss, proximate and ultimate analyses, heat of combustion, forms of sulfur, ash fusion temperatures, free-swelling index, and major-, minor-, and trace-element concentrations.

INTRODUCTION

Stratigraphic Occurrence

The Pennsylvanian System in the mid-continental United States is divided into five series. From oldest to youngest, they are the Morrowan, Atokan, Desmoinesian, Missourian, and Virgilian. Stratigraphic groups within the series are recognized by various names among the states (Figure 1). Coal beds occur throughout the sequence.

The major coal resources occur in the Cherokee and Marmaton Groups of DesMoinesian age.

Scope of Report

This report presents analytical data obtained from the U.S. Geological Survey's National Coal Resources Data System (NCRDS). One NCRDS database, USCHEM (U.S. GeoCHEMical data base), includes proximate and ultimate analyses, major-, minor-, and trace-element concentrations, forms-of-sulfur analyses, ash fusion temperatures, heat of combustion, air-drying loss, and free swelling indices. Although analyses of 460 coal samples and 15 rock samples compose the available USCHEM data base for the entire Western Interior Region, this report includes analyses that have not been previously published and are not currently being prepared for publication by the collector. Coal occurrence in each state is discussed in a separate section and references containing analytical data are cited.

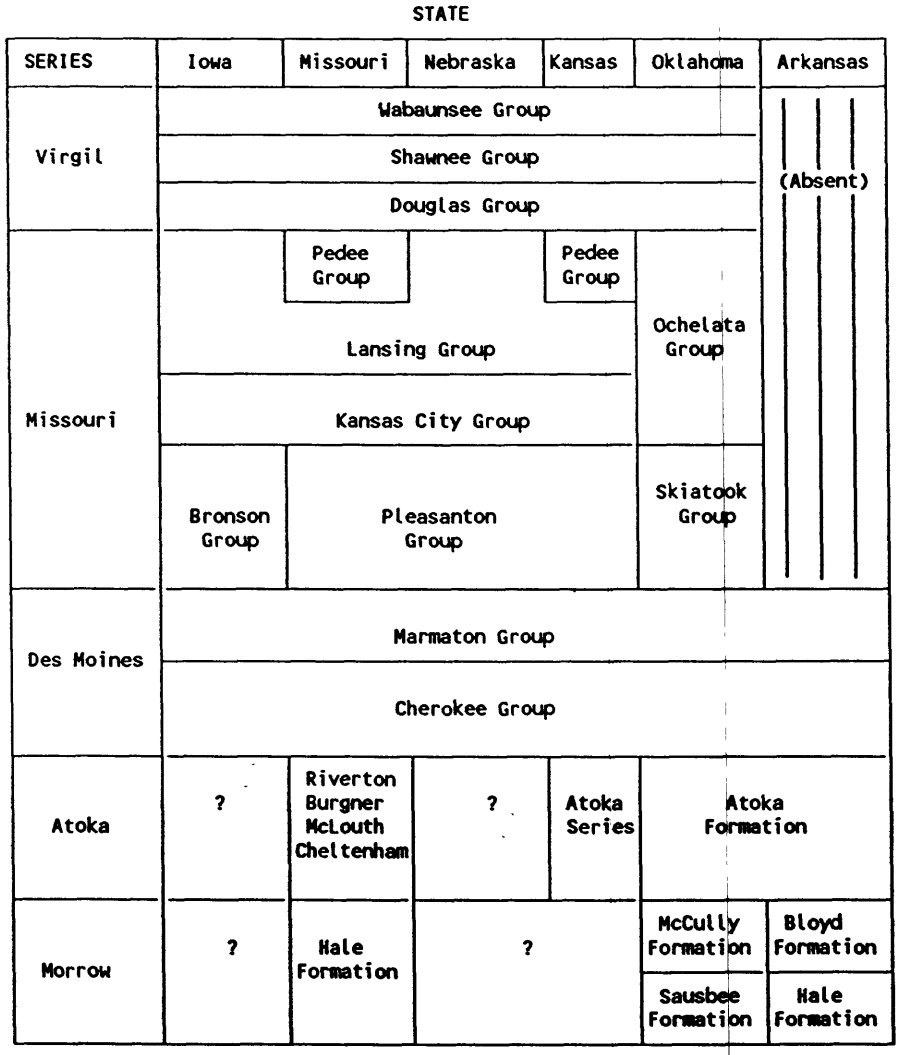

Figure 1. Main divisions of the Pennsylvanian-age strata in the states of the Western Interior region.

METHODS

Most of the coal samples were collected and prepared according to procedures outlined in Swanson and Huffman (1976). Non-standard sampling methods have been noted in the data tables. Proximate and ultimate analyses have been done according to standard methods (ASTM, 1989) by the U.S. Bureau of Mines. Coal analyses performed at the U.S. Geological Survey involve several analytical methods including wet chemical analysis, atomic absorption spectroscopy, X-ray fluorescence spectroscopy, six-step emission spectrography, and instrumental neutron activation analysis (Golightly and Simon, 1989).

PRESENTATION OF DATA

USCHEM analytical data for previously unpublished samples are presented separately for each of the five states, which are arranged in alphabetical order. Raw data are presented in four sub-tables, with each state beginning a new set of sub-tables. Location, stratigraphic occurrence, and other sample information are contained in sub-table "a". Proximate and ultimate analyses, forms-of-sulfur, heat of combustion, air-drying loss, free-swelling index, and ash fusion temperatures are in sub-table "b". The U.S. Geological Survey makes no claims as to the accuracy of apparent rank calculated from parameters listed in sub-table "b". Sub-table "c" contains major oxides on an ash basis. Major-, minor-, and trace-element analyses on a whole-coal basis are presented in sub-table "d".

For a discussion of coal quality and statistical analysis of NCRDS-USCHEM data in the Western Interior Region, see Wedge and Hatch (1980) and Finkelman and Tewalt (1990).

The USCHEM data base contains analyses of 30 coal samples from the Arkansas Valley coal field. Coal ranges in rank from low-volatile bituminous in the western part to semi-anthracite in the eastern part. Coal beds that have been sampled are shown in Figure 2. Sampling localities are shown in Figure 3. Most of the USCHEM data have been presented in earlier publications: Swanson and others (1976) and Haley (1987). Information on six coal samples is presented in Tables 1a through 1d.

SERIES	FORMATION	BED
Des Moines	Boggy	
	Savanna	Charleston Paris
	McAlester	Hartshorne
	Hartshorne SS	
Atoka	Atoka	Unnamed

Figure 2. Stratigraphic column for coal-bearing units in Arkansas that are represented in the USCHEM data base.

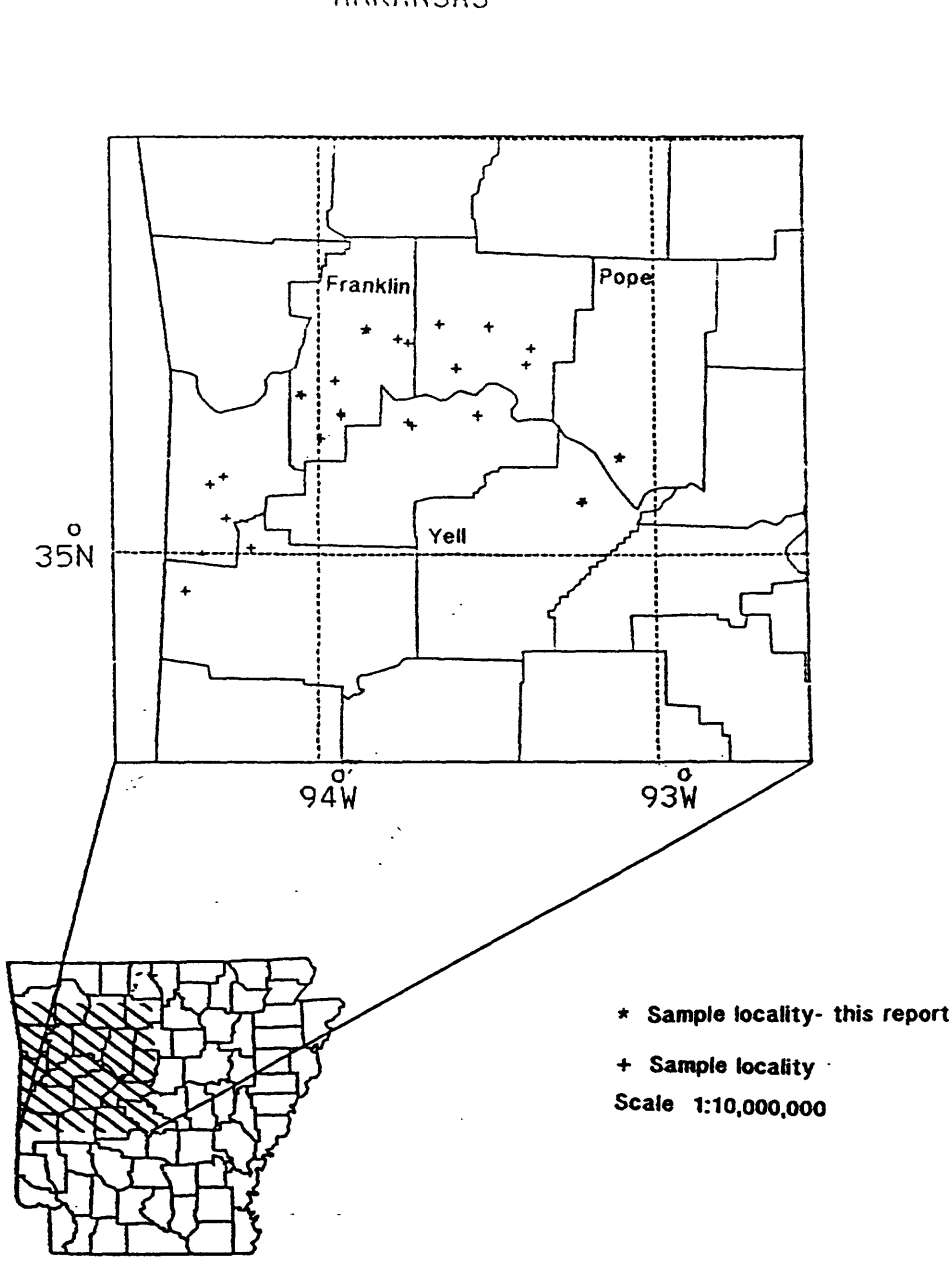

Figure 3. Collecting localities for USCHEM coal samples in Arkansas. County boundaries are indicated.

Table 1a. Sample information for USCHEM data from Arkansas.

[NDE means no data entered. Depth is the interval to the top of the sample. For channel samples depth is usually 0.0 (except where collected in benched intervals); for cored samples depth is measured from the top of the core.]

Sample Number	State	County	Latitude	Longitude	Quadrangle	Location/Source
D189166	ARKANSAS	FRANKLIN	353245 N	935125 W	WATALULA (7.5')	4 MI NW OF OZARK
D194469	ARKANSAS	FRANKLIN	352312 N	940300 W	MULBERRY (7.5')	6 MI N OF CHARLESTON
D189164	ARKANSAS	POPE	351420 N	930615 W	HOLLA BEND (7.5')	4 MI SE OF RUSSELLVILLE
D189165	ARKANSAS	POPE	351420 N	930615 W	HOLLA BEND (7.5')	4 MI SE OF RUSSELLVILLE
D228188	ARKANSAS	YELL	350750 N	931305 W	DARDANELLE (7.5')	STRIP MINE
D228189	ARKANSAS	YELL	350750 N	931305 W	DARDANELLE (7.5')	STRIP MINE

Sample Number	Field Id no.	Collector	Formation	Group	Bed Name	Zone
D189166	PAT-2	USGS-HALEY B R	ATOKA	NDE	UNNAMED	NDE
D194469	ARK-LH-18	USGS-HALEY B R	MCALESTER	NDE	LOWER HARTSHORNE	NDE
D189164	LH16	USGS-HALEY B R	MCALESTER	NDE	LOWER HARTSHORNE	NDE
D189165	LH17	USGS-HALEY B R	MCALESTER	NDE	LOWER HARTSHORNE RIDER	NDE
D228188	SAMPLE 1 PAT	ARGC-BUSH W V	ATOKA	NDE	UNNAMED	NDE
D228189	SAMPLE 2 PAT	ARGC-BUSH W V	ATOKA	NDE	UNNAMED	NDE

Sample Number	Depth (feet)	Sample Thickness (feet)	Analytical Labs	Sample Type	Data Values Represent	Estmiated Rank	Field
D189166	3.0	1.1	US BUR. MINES/US GEOL. SURVEY	CHANNEL	SINGLE SAMPLE	BITUMINOUS	ARKANSAS VALLEY
D194469	0.0	1.3	US BUR. MINES/US GEOL. SURVEY	CHANNEL	SINGLE SAMPLE	BITUMINOUS	ARKANSAS VALLEY
D189164	0.0	2.3	US BUR. MINES/US GEOL. SURVEY	CHANNEL	SINGLE SAMPLE	SEMI-ANTHRACITE	ARKANSAS VALLEY
D189165	0.0	1.0	US BUR. MINES/US GEOL. SURVEY	CHANNEL	SINGLE SAMPLE	SEMI-ANTHRACITE	ARKANSAS VALLEY
D228188	0.0	1.2	US BUR. MINES/US GEOL. SURVEY	CHANNEL	SINGLE SAMPLE	BITUMINOUS	ARKANSAS VALLEY
D228189	0.0	1.2	US BUR. MINES/ US GEOL. SURVEY	CHANNEL	SINGLE SAMPLE	BITUMINOUS	ARKANSAS VALLEY

Table 1b. Proximate and ultimate analyses, heat of combustion, forms of sulfur, free-swelling index, and ash-fusion temperature determinations for Arkansas coal samples.

[All analyses in percent except Kcal/kg, Btu/lb, free-swelling index, and ash-fusion temperatures. For each sample number, the analyses are reported three ways: first, as received (moisture included in H and O); second, moisture-free; and third, moisture- and ash-free. Analyses are by a commercial testing laboratory following ASTM standards. G for ash-fusion temperatures means greater than 1540° C.]

	Proximate Analysis				Ultimate Analysis					Heat of Combustion	
Sample Number	Moisture	Volatile Matter	Fixed Carbon	Ash	Hydrogen	Carbon	Nitrogen	Oxygen	Sulfur	Kcal/kg	Btu/lb
D189166	.7	19.7	75.6	4.0	4.5	86.2	1.8	2.8	.7	8,350	15,030
	---	19.8	76.1	4.0	4.5	86.8	1.8	2.2	.7	8,410	15,130
	---	20.7	79.3	---	4.6	90.5	1.9	2.3	.7	8,760	15,770
D194469	.6	18.9	76.1	4.4	4.5	84.3	1.8	3.2	1.7	8,270	14,890
	---	19.0	76.6	4.4	4.5	84.8	1.8	2.7	1.7	8,320	14,980
	---	19.9	80.1	---	4.7	88.7	1.9	2.8	1.8	8,710	15,670
D189164	3.3	11.1	72.8	12.8	3.7	76.0	1.5	4.5	1.5	7,200	12,960
	---	11.5	75.3	13.2	3.4	78.6	1.6	1.6	1.6	7,450	13,400
	---	13.2	86.8	---	4.0	90.6	1.8	1.9	1.8	8,580	15,450
D189165	2.5	11.3	56.9	29.3	3.5	58.3	1.2	3.9	3.8	5,630	10,130
	---	11.6	58.4	30.1	3.3	59.8	1.2	1.7	3.9	5,770	10,390
	---	16.6	83.4	---	4.7	85.5	1.8	2.5	5.6	8,250	14,850

Table 1b. (cont'd.) Proximate and ultimate analyses, heat of combustion, forms of sulfur, free-swelling index, and ash-fusion temperature determinations for Arkansas coal samples.

Sample Number	Air-dried Loss	Forms of Sulfur: Sulfate	Forms of Sulfur: Pyritic	Forms of Sulfur: Organic	Free Swelling Index	Ash Fusion Temperature, °C: Initial Deformation	Ash Fusion Temperature, °C: Softening	Ash Fusion Temperature, °C: Fluid
D189166	1.0	.01	.29	.44	0.	1,235	1,295	1,350
	---	.01	.29	.44				
	---	.01	.30	.46				
D194469	.1	.03	1.22	.48	9.0	1,070	1,125	1,180
	---	.03	1.23	.48				
	---	.03	1.28	.51				
D189164	1.2	0.01	1.10	0.35	0.	1,240	1,290	1,345
	---	.01	1.14	.36				
	---	.01	1.31	.42				
D189165	.7	.01	3.23	.56	0.	1,505	1,540	1,540G
	---	.01	3.31	.57				
	---	.01	4.74	.82				

Table 1c. Major- and minor- oxides concentrations in the laboratory ash of Arkansas coal samples.

[Values in percent. Coal ashed at 525 °C. L means less than value shown; B not determined.]

Sample Number	Ash (percent)	SiO_2 (percent)	Al_2O_3 (percent)	CaO (percent)	MgO (percent)	Na_2O (percent)	K_2O (percent)	Fe_2O_3 (percent)	TiO_2 (percent)	P_2O_5 (percent)	SO_3 (percent)	Sample Number
D189166	4.3	14	23	13	3.5	2.1	1.0	25	.96	2.6	17	D189166
D194469	4.9	29	20	4.5	3.0	1.2	1.1	23	.83	1.0L	11	D194469
D189164	12.8	34	27	7.4	3.3	0.71	1.3	13	1.1	1.3	7.4	D189164
D189165	30.9	40	29	2.3	1.2	.34	2.0	20	.86	1.0L	1.5	D189165
D228188	10.1	15	10	4.3	2.8	.14	.82	53	.47	.99	B	D228188
D228189	8.4	26	15	4.9	5.6	.49	1.3	33	.62	.83	B	D228189

Table 1d. Major-, minor-, and trace-element concentrations of Arkansas coal samples.

[Values in percent or parts-per-million. Elements not determined on whole coal have been calculated from analyses of ash. S means analysis by six-step emission spectrography; L, less than the value shown; B, not determined; N, not detected.]

Sample Number	Si (percent)	Al (percent)	Ca (percent)	Mg (percent)	Na (percent)	K (percent)	Fe (percent)	Ti (percent)	Ag-S (ppm)	As (ppm)	Sample Number
D189166	.28	.52	.40	.089	.065	.036	.75	.025	N	7.9	D189166
D194469	.66	.52	.16	.089	.044	.045	.79	.024	N	26	D194469
D189164	2.0	1.8	0.68	0.25	0.067	0.14	1.2	0.084	N	11	D189164
D189165	5.8	4.7	.51	.22	.078	.51	4.3	.16	N	26	D189165
D228188	.72	.54	.31	.17	.010	.069	3.7	.028	.10	43	D228188
D228189	1.0	.66	.29	.29	.030	.093	1.9	.031	.10	52	D228189

Sample Number	B-S (ppm)	Ba-S (ppm)	Be-S (ppm)	Cd (ppm)	Ce (ppm)	Cl (ppm)	Co (ppm)	Cr (ppm)	Cu (ppm)	Dy-S (ppm)	Sample Number
D189166	6.5	64	.43	.043L	22	B	17	7.4	15	N	D189166
D194469	4.9	25	.49	.049L	25L	B	8.7	9.6	19	N	D194469
D189164	19	90	0.90	0.13	N	B	6.1	23	30	N	D189164
D189165	31	62	1.5	.31	N	B	24	55	50	N	D189165
D228188	7.8	31	.29	.024	47	300	11	7.0	6.9	2.2L	D228188
D228189	6.6	26	.39	.034	27	300	16	10	7.4	2.1	D228189

Table 1d. (cont'd.) Major-, minor-, and trace-element concentrations of Arkansas coal samples.

Sample Number	F (ppm)	Ga-S (ppm)	Gd-S (ppm)	Hg (ppm)	La (ppm)	Li (ppm)	Mn (ppm)	Mo-S (ppm)	Nb-S (ppm)	Nd-S (ppm)	Sample Number
D189166	95	.86	N	.10	6.5	2.0	7.5	.86	N	6.5	D189166
D194469	55	2.5	N	.12	7.4	8.5	11	3.4	N	7.4L	D194469
D189164	170	3.8	N	0.20	9.0	27	51	1.9	N	N	D189164
D189165	280	15	N	1.4	22	83	60	4.6	N	N	D189165
D228188	11	2.5	12	.030	5.9	4.0	230	4.4	1.1	3.2L	D228188
D228189	75	1.8	5.6	.030	3.9	4.0	23	2.8	.72	2.7L	D228189

Sample Number	Ni-S (ppm)	P (ppm)	Pb (ppm)	Pr-S (ppm)	Sb (ppm)	Sc (ppm)	Se (ppm)	Sr-S (ppm)	Th (ppm)	U (ppm)	Sample Number
D189166	8.6	490	1.5	8.6L	.16	.86	2.2	130	.93	.90	D189166
D194469	15	210L	1.7	N	.29	1.5	1.3	49	1.2	1.9	D194469
D189164	19	730	7.7	N	0.46	3.8	2.7	90	3.7	2.7	D189164
D189165	62	1,400L	31	N	1.6	9.3	6.0	46	7.6	5.4	D189165
D228188	15	440	3.8	15	.51	.79	1.1	69	.84	.52	D228188
D228189	18	310	6.2	11	.81	1.0	1.2	70	1.2	.78	D228189

Sample Number	V-S (ppm)	Y-S (ppm)	Yb (ppm)	Zn (ppm)	Zr-S (ppm)
D189166	6.5	8.6	.65	4.6	4.3
D194469	9.8	4.9	.49	26	4.9
D189164	38	13	1.3	19	13
D189165	93	22	3.1	65	31
D228188	7.2	3.5	.38	3.8	6.4
D228189	12	4.5	.33	6.7	6.2

IOWA

There are 144 samples from the Cherokee Group of Iowa in the USCHEM data base; 137 are coal and 7 are associated rock samples. One additional coal sample is from the Marmaton Group (Figure 4). Figure 5 shows the sampling localities for these data. Several publications present information on Iowa samples from the USCHEM data base: Swanson and others (1976), Hatch and others (1976), and Hatch and others (1984). In this report data for 33 coal and 6 rock samples from the Cherokee Group are presented in Tables 2a through 2d.

SERIES	GROUP
Des Moines	Marmaton
	Cherokee

Figure 4. Stratigraphic column for coal-bearing units in Iowa that are represented in the USCHEM data base.

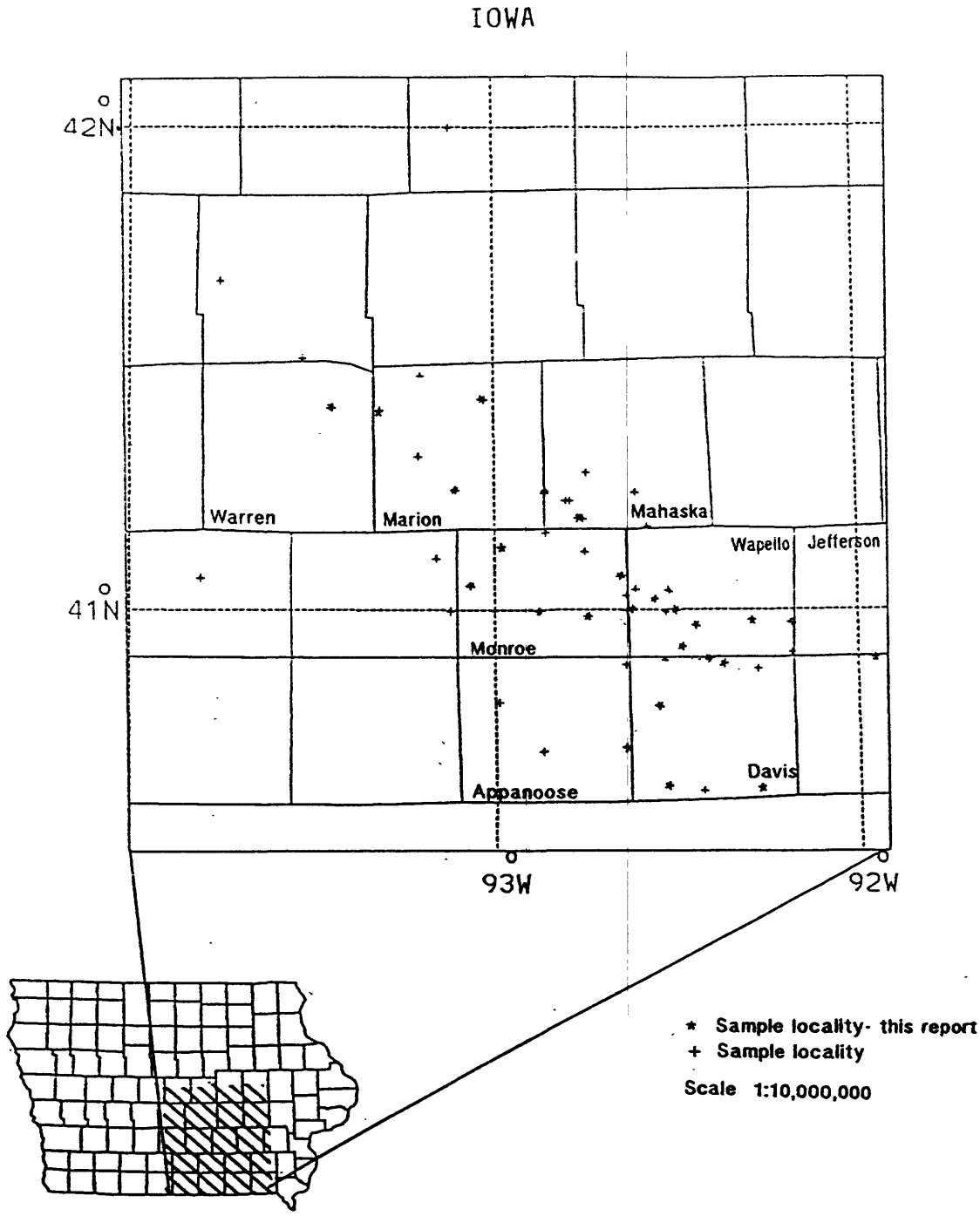

Figure 5. Collecting localities for USCHEM coal samples in Iowa. County boundaries are indicated.

Table 2a. Sample information for USCHEM data from Iowa.

[NDE means no data entered. Depth is the interval to the top of the sample. For channel samples depth is usually 0.0 (except where collected in benched intervals); for cored samples depth is measured from the top of the core.]

Sample Number	State	County	Latitude	Longitude	Quadrangle	Location/Source
D211729	IOWA	APPANOOSE	404315 N	923835 W	CENTERVILLE (15')	DRILL CORE
D211761	IOWA	DAVIS	403830 N	923130 W	CENTERVILLE (2 DEGREE)	DRILL CORE
D211730	IOWA	DAVIS	405355 N	923200 W	BLAKESBURG NE (7.5')	DRILL CORE
D211731	IOWA	DAVIS	403830 N	923130 W	CENTERVILLE (2 DEGREE)	DRILL CORE
D211732	IOWA	DAVIS	403830 N	923130 W	CENTERVILLE (2 DEGREE)	DRILL CORE
D211733	IOWA	DAVIS	403815 N	921610 W	CENTERVILLE (2 DEGREE)	DRILL CORE
D211734	IOWA	DAVIS	404821 N	923305 W	PARIS (7.5')	DRILL CORE
D211735	IOWA	DAVIS	404821 N	923305 W	PARIS (7.5')	DRILL CORE
D211736	IOWA	DAVIS	405331 N	922159 W	AGENCY (7.5')	DRILL CORE
D211728	IOWA	JEFFERSON	405405 N	915710 W	BURLINGTON (2 DEGREE)	DRILL CORE
D166022	IOWA	MAHASKA	410730 N	924500 W	BUXTON (7.5')	NDE
D166023	IOWA	MAHASKA	410730 N	924500 W	BUXTON (7.5')	NDE
D166024	IOWA	MAHASKA	410730 N	924500 W	BUXTON (7.5')	NDE
D211752	IOWA	MAHASKA	410942 N	925117 W	ALBIA (15')	DRILL CORE
D211753	IOWA	MAHASKA	411458 N	925125 W	ALBIA (15')	DRILL CORE
D211754	IOWA	MAHASKA	411137 N	924600 W	ALBIA (15')	NDE
D185607	IOWA	MARION	412615 N	930140 W	OTLEY (7.5')	NDE
D185608	IOWA	MARION	412615 N	930140 W	OTLEY (7.5')	NDE
D211717	IOWA	MARION	411505 N	930635 W	KNOXVILLE (7.5')	DRILL CORE
D211718	IOWA	MARION	411505 N	930635 W	KNOXVILLE (7.5')	DRILL CORE
D211719	IOWA	MARION	412502 N	931900 W	PLEASANTVILLE (7.5')	DRILL CORE
D186077	IOWA	MONROE	410310 N	930410 W	MELCHER (15')	LOVILLA NO 2 MINE
D166025	IOWA	MONROE	410000 N	925230 W	HITEMAN (7.5')	NDE
D211755	IOWA	MONROE	410800 N	925850 W	ALBIA (15')	STAR MINE
D211756	IOWA	MONROE	410800 N	925850 W	ALBIA (15')	STAR MINE
D211757	IOWA	MONROE	405922 N	924418 W	BLAKESBURG (7.5')	DRILL CORE
D211720	IOWA	MONROE	410427 N	923902 W	AVERY (7.5')	DRILL CORE
D166026	IOWA	WAPELLO	410000 N	923000 W	CHILLICOTHE (7.5')	NDE
D211758	IOWA	WAPELLO	405836 N	921048 W	ELDON (7.5')	DRILL CORE
D211759	IOWA	WAPELLO	405538 N	922855 W	OTTUMWA SOUTH (7.5')	DRILL CORE
D211760	IOWA	WAPELLO	405538 N	922855 W	OTTUMWA SOUTH (7.5')	DRILL CORE
D211721	IOWA	WAPELLO	405857 N	921730 W	AGENCY (7.5')	DRILL CORE
D211722	IOWA	WAPELLO	410000 N	923820 W	AVERY (7.5')	DRILL CORE
D211723	IOWA	WAPELLO	405815 N	922647 W	OTTUMWA SOUTH (7.5')	DRILL CORE
D211724	IOWA	WAPELLO	405815 N	922647 W	OTTUMWA SOUTH (7.5')	DRILL CORE
D211725	IOWA	WAPELLO	410133 N	923335 W	CHILLICOTHE (7.5')	DRILL CORE
D211726	IOWA	WAPELLO	405538 N	922855 W	OTTUMWA SOUTH (7.5')	DRILL CORE
D211727	IOWA	WAPELLO	405538 N	922855 W	OTTUMWA SOUTH (7.5')	DRILL CORE
D211716	IOWA	WARREN	412520 N	932655 W	HARTFORD (7.5')	DRILL CORE

Table 2a. (cont'd). Sample information for USCHEM data from Iowa.

Sample Number	Field Id No.	Collector	Formation	Group	Bed Name	Zone
D211729	CP-11-4	IAGS-AVCIN M J	NDE	CHEROKEE	UNNAMED	NDE
D211761	CP-23-2	IAGS-AVCIN M J	NDE	CHEROKEE	UNNAMED	NDE
D211730	CP-8-12	IAGS-AVCIN M J	NDE	CHEROKEE	UNNAMED	NDE
D211731	CP-23-17	IAGS-AVCIN M J	NDE	CHEROKEE	UNNAMED	NDE
D211732	CP-23-21	IAGS-AVCIN M J	NDE	CHEROKEE	UNNAMED	NDE
D211733	CP-25-13	IAGS-AVCIN M J	NDE	CHEROKEE	UNNAMED	NDE
D211734	CP-49-7	IAGS-AVCIN M J	NDE	CHEROKEE	UNNAMED	NDE
D211735	CP-49-11	IAGS-AVCIN M J	NDE	CHEROKEE	UNNAMED	NDE
D211736	CP-72-184	IAGS-AVCIN M J	NDE	CHEROKEE	UNNAMED	NDE
D211728	CP-1-8	IAGS-AVCIN M J	NDE	CHEROKEE	UNNAMED	NDE
D166022	1-C-73	IAGS-AVCIN M J	NDE	CHEROKEE	NDE	NDE
D166023	2-C-73	IAGS-AVCIN M J	NDE	CHEROKEE	NDE	NDE
D166024	3-C-73	IAGS-AVCIN M J	NDE	CHEROKEE	NDE	NDE
D211752	CP-39-16	IAGS-AVCIN M J	NDE	CHEROKEE	UNNAMED	NDE
D211753	CP-40A-11	IAGS-AVCIN M J	NDE	CHEROKEE	UNNAMED	NDE
D211754	JUDE FACE	IAGS-AVCIN M J	NDE	CHEROKEE	UNNAMED	NDE
D185607	E-B	IAGS-AVCIN M J	NDE	CHEROKEE	NDE	NDE
D185608	E-C	IAGS-AVCIN M J	NDE	CHEROKEE	NDE	NDE
D211717	CP-41-58	IAGS-AVCIN M J	NDE	CHEROKEE	UNNAMED	NDE
D211718	CP-41-60	IAGS-AVCIN M J	NDE	CHEROKEE	UNNAMED	NDE
D211719	CP-43-44	IAGS-AVCIN M J	NDE	CHEROKEE	UNNAMED	NDE
D186077	L2-SB	IAGS-AVCIN M J	NDE	CHEROKEE	NDE	NDE
D166025	4-C-73	IAGS-AVCIN M J	NDE	CHEROKEE	NDE	NDE
D211755	STAR III	IAGS-AVCIN M J	NDE	CHEROKEE	UNNAMED	NDE
D211756	STAR II	IAGS-AVCIN M J	NDE	CHEROKEE	UNNAMED	NDE
D211757	CP-52-14	IAGS-AVCIN M J	NDE	CHEROKEE	UNNAMED	NDE
D211720	CP-16-7	IAGS-AVCIN M J	NDE	CHEROKEE	UNNAMED	NDE
D166026	7-C-73	IAGS-AVCIN M J	NDE	CHEROKEE	NDE	NDE
D211758	CP-65-164	IAGS-AVCIN M J	NDE	CHEROKEE	UNNAMED	NDE
D211759	CP-73-261	IAGS-AVCIN M J	NDE	CHEROKEE	UNNAMED	NDE
D211760	CP-73-299	IAGS-AVCIN M J	NDE	CHEROKEE	UNNAMED	NDE
D211721	CP-4-13	IAGS-AVCIN M J	NDE	CHEROKEE	UNNAMED	NDE
D211722	CP-14-5	IAGS-AVCIN M J	NDE	CHEROKEE	UNNAMED	NDE
D211723	CP-27-12	IAGS-AVCIN M J	NDE	CHEROKEE	UNNAMED	NDE
D211724	CP-27-15	IAGS-AVCIN M J	NDE	CHEROKEE	UNNAMED	NDE
D211725	CP-29-15	IAGS-AVCIN M J	NDE	CHEROKEE	UNNAMED	NDE
D211726	CP-73-306	IAGS-AVCIN M J	NDE	CHEROKEE	UNNAMED	NDE
D211727	CP-73-317	IAGS-AVCIN M J	NDE	CHEROKEE	UNNAMED	NDE
D211716	CP-44-61	IAGS-AVCIN M J	NDE	CHEROKEE	UNNAMED	NDE

Table 2a. (cont'd). Sample information for USCHEM data in Iowa.

Sample Number	Depth (feet)	Sample Thickness (feet)	Analytical Labs	Sample Type	Data Values Represent	Estimated Rank	Field
D211729	336.0	0.7	US BUR. MINES/US GEOL. SURVEY	DRILL CORE	SINGLE SAMPLE	BITUMINOUS	NDE
D211761	183.2	2.6	US BUR. MINES/US GEOL. SURVEY	DRILL CORE	SINGLE SAMPLE	BITUMINOUS	NDE
D211730	230.4	1.8	US BUR. MINES/US GEOL. SURVEY	DRILL CORE	SINGLE SAMPLE	BITUMINOUS	NDE
D211731	314.5	1.0	US BUR. MINES/US GEOL. SURVEY	DRILL CORE	SINGLE SAMPLE	BITUMINOUS	NDE
D211732	330.6	1.0	US BUR. MINES/US GEOL. SURVEY	DRILL CORE	SINGLE SAMPLE	BITUMINOUS	NDE
D211733	259.8	1.1	US BUR. MINES/US GEOL. SURVEY	DRILL CORE	SINGLE SAMPLE	BITUMINOUS	NDE
D211734	346.8	1.4	US BUR. MINES/US GEOL. SURVEY	DRILL CORE	SINGLE SAMPLE	BITUMINOUS	NDE
D211735	358.4	0.5	US BUR. MINES/US GEOL. SURVEY	DRILL CORE	SINGLE SAMPLE	BITUMINOUS	NDE
D211736	184.1	1.0	US BUR. MINES/US GEOL. SURVEY	DRILL CORE	SINGLE SAMPLE	BITUMINOUS	NDE
D211728	76.9	1.1	US BUR. MINES/US GEOL. SURVEY	DRILL CORE	SINGLE SAMPLE	BITUMINOUS	NDE
D166022	NDE	NDE	US GEOL. SURVEY	GRAB	SINGLE SAMPLE	SHALE	NDE
D166023	NDE	NDE	US GEOL. SURVEY	GRAB	SINGLE SAMPLE	SHALE	NDE
D166024	NDE	NDE	US GEOL. SURVEY	GRAB	SINGLE SAMPLE	SHALE	NDE
D211752	183.1	3.7	US BUR. MINES/US GEOL. SURVEY	DRILL CORE	SINGLE SAMPLE	BITUMINOUS	NDE
D211753	99.4	2.6	US BUR. MINES/US GEOL. SURVEY	DRILL CORE	SINGLE SAMPLE	BITUMINOUS	NDE
D211754	0.0	4.0	US BUR. MINES/US GEOL. SURVEY	CHANNEL	SINGLE SAMPLE	BITUMINOUS	NDE
D185607	0.0	2.2	US BUR. MINES/US GEOL. SURVEY	CHANNEL	COMPOSITE SAMPLE	BITUMINOUS	NDE
D185608	0.0	2.2	US BUR. MINES/US GEOL. SURVEY	CHANNEL	COMPOSITE SAMPLE	BITUMINOUS	NDE
D211717	332.2	0.6	US BUR. MINES/US GEOL. SURVEY	DRILL CORE	SINGLE SAMPLE	BITUMINOUS	NDE
D211718	346.1	1.0	US BUR. MINES/US GEOL. SURVEY	DRILL CORE	SINGLE SAMPLE	BITUMINOUS	NDE
D211719	268.4	0.6	US BUR. MINES/US GEOL. SURVEY	DRILL CORE	SINGLE SAMPLE	BITUMINOUS	NDE
D186077	NDE	NDE	US GEOL. SURVEY	GRAB	SINGLE SAMPLE	ROCK	NDE
D166025	NDE	NDE	US GEOL. SURVEY	GRAB	SINGLE SAMPLE	SHALE	NDE
D211755	0.0	3.0	US BUR. MINES/US GEOL. SURVEY	CHANNEL	SINGLE SAMPLE	BITUMINOUS	NDE
D211756	0.0	3.0	US BUR. MINES/US GEOL. SURVEY	CHANNEL	SINGLE SAMPLE	BITUMINOUS	NDE
D211757	223.0	4.6	US BUR. MINES/US GEOL. SURVEY	DRILL CORE	SINGLE SAMPLE	BITUMINOUS	NDE
D211720	68.7	1.0	US BUR. MINES/US GEOL. SURVEY	DRILL CORE	SINGLE SAMPLE	BITUMINOUS	NDE
D166026	NDE	NDE	US GEOL. SURVEY	GRAB	SINGLE SAMPLE	SHALE	NDE
D211758	164.5	2.3	US BUR. MINES/US GEOL. SURVEY	DRILL CORE	SINGLE SAMPLE	BITUMINOUS	NDE
D211759	261.2	2.8	US BUR. MINES/US GEOL. SURVEY	DRILL CORE	SINGLE SAMPLE	BITUMINOUS	NDE
D211760	299.7	2.9	US BUR. MINES/US GEOL. SURVEY	DRILL CORE	SINGLE SAMPLE	BITUMINOUS	NDE
D211721	251.1	1.2	US BUR. MINES/US GEOL. SURVEY	DRILL CORE	SINGLE SAMPLE	BITUMINOUS	NDE
D211722	66.7	0.5	US BUR. MINES/US GEOL. SURVEY	DRILL CORE	SINGLE SAMPLE	BITUMINOUS	NDE
D211723	161.9	0.8	US BUR. MINES/US GEOL. SURVEY	DRILL CORE	SINGLE SAMPLE	BITUMINOUS	NDE
D211724	173.1	0.9	US BUR. MINES/US GEOL. SURVEY	DRILL CORE	SINGLE SAMPLE	BITUMINOUS	NDE
D211725	135.6	1.4	US BUR. MINES/US GEOL. SURVEY	DRILL CORE	SINGLE SAMPLE	BITUMINOUS	NDE
D211726	306.1	1.2	US BUR. MINES/US GEOL. SURVEY	DRILL CORE	SINGLE SAMPLE	BITUMINOUS	NDE
D211727	317.1	1.3	US BUR. MINES/US GEOL. SURVEY	DRILL CORE	SINGLE SAMPLE	BITUMINOUS	NDE
D211716	282.8	1.7	US BUR. MINES/US GEOL. SURVEY	DRILL CORE	SINGLE SAMPLE	BITUMINOUS	NDE

Table 2b. Proximate and ultimate analyses, heat of combustion, forms of sulfur, free-swelling index, and ash-fusion temperature determinations for Iowa coal samples.

[All analyses in percent except Kcal/kg, Btu/lb, free-swelling index, and ash-fusion temperatures. For each sample number, the analyses are reported three ways: first, as received (moisture included in H and O); second, moisture-free; and third, moisture- and ash-free. Analyses are by a commercial testing laboratory following ASTM standards.]

	Proximate Analysis				Ultimate Analysis					Heat of Combustion	
Sample Number	Moisture	Volatile Matter	Fixed Carbon	Ash	Hydrogen	Carbon	Nitrogen	Oxygen	Sulfur	Kcal/kg	Btu/lb
D211761	7.6	31.9	45.2	15.3	4.8	54.0	1.0	17.7	7.3	5,400	9,720
	---	34.5	48.9	16.6	4.3	58.4	1.1	11.8	7.9	5,840	10,520
	---	41.4	58.6	---	5.1	70.0	1.3	14.2	9.5	7,000	12,600
D211752	5.1	18.0	19.9	57.0	2.6	20.4	.5	13.3	6.2	1,890	3,410
	---	19.0	21.0	60.1	2.1	21.5	.5	9.2	6.5	1,990	3,590
	---	47.5	52.5	---	5.4	53.8	1.3	23.1	16.4	4,990	8,990
D211753	4.6	30.7	38.4	26.3	4.3	50.6	.9	12.4	5.5	5,040	9,080
	---	32.2	40.3	27.6	4.0	53.0	.9	8.7	5.8	5,290	9,510
	---	44.4	55.6	---	5.5	73.2	1.3	12.0	8.0	7,300	13,140
D211754	13.4	33.5	36.2	16.9	5.3	53.1	.8	17.7	6.1	5,330	9,590
	---	38.7	41.8	19.5	4.4	61.3	.9	6.7	7.0	6,150	11,080
	---	48.1	51.9	---	5.5	76.2	1.1	8.3	8.8	7,650	13,760
D185607	21.1	31.6	36.1	11.2	5.7	51.1	.9	27.9	3.2	5,030	9,050
	---	40.1	45.8	14.2	4.3	64.8	1.1	11.6	4.1	6,370	11,470
	---	46.7	53.3	---	5.0	75.5	1.3	13.5	4.7	7,430	13,370
D185608	21.1	31.6	36.1	11.2	5.7	51.1	.9	27.9	3.2	5,030	9,050
	---	40.1	45.8	14.2	4.3	64.8	1.1	11.6	4.1	6,370	11,470
	---	46.7	53.3	---	5.0	75.5	1.3	13.5	4.7	7,430	13,370
D211755	8.8	34.0	42.5	14.7	5.1	60.1	1.3	15.4	3.4	5,960	10,720
	---	37.3	46.6	16.1	4.5	65.9	1.4	8.3	3.7	6,530	11,760
	---	44.4	55.6	---	5.4	78.6	1.7	9.9	4.4	7,790	14,020
D211756	7.8	39.2	45.3	7.7	5.4	66.5	1.5	15.9	2.9	6,660	11,980
	---	42.5	49.1	8.4	4.9	72.1	1.6	9.7	3.1	7,220	12,990
	---	46.4	53.6	---	5.4	78.7	1.8	10.6	3.4	7,880	14,180
D211757	6.0	40.1	39.3	14.6	5.0	58.5	.8	13.9	7.1	5,960	10,730
	---	42.7	41.8	15.5	4.6	62.2	.9	9.1	7.6	6,340	11,410
	---	50.5	49.5	---	5.5	73.7	1.0	10.8	8.9	7,510	13,510
D211758	8.5	32.4	40.4	18.7	4.6	52.7	.8	12.8	10.4	5,420	9,760
	---	35.4	44.2	20.4	4.0	57.6	.9	5.7	11.4	5,920	10,660
	---	44.5	55.5	---	5.0	72.4	1.1	7.2	14.3	7,440	13,400
D211759	11.2	34.1	37.2	17.5	5.1	53.6	1.0	15.9	6.9	5,360	9,640
	---	38.4	41.9	19.7	4.3	60.4	1.1	6.7	7.8	6,030	10,860
	---	47.8	52.2	---	5.4	75.2	1.4	8.3	9.7	7,510	13,520

Table 2b. (cont'd.) Proximate and ultimate analyses, heat of combustion, forms of sulfur, free-swelling index, and ash-fusion temperature determinations for Iowa coal samples.

Sample Number	Air-dried Loss	------Forms of Sulfur------			Free Swelling Index	----Ash Fusion Temperature, °C----		
		Sulfate	Pyritic	Organic		Initial Deformation	Softening	Fluid
D211761	3.5	1.90	4.48	0.91	0.	1,050	1,095	1,155
	---	2.06	4.85	.98				
	---	2.46	5.81	1.18				
D211752	1.0	1.60	4.00	.58	0.	1,315	1,355	1,425
	---	1.69	4.21	.61				
	---	4.22	10.55	1.53				
D211753	1.4	.95	3.00	1.54	0.	1,160	1,230	1,300
	---	1.00	3.14	1.61				
	---	1.37	4.34	2.23				
D211754	9.1	1.07	2.11	2.89	0.	1,090	1,140	1,190
	---	1.24	2.44	3.34				
	---	1.54	3.03	4.15				
D185607	16.5	.47	.99	1.70	0.	1,100	1,150	1,215
	---	.60	1.25	2.15				
	---	.69	1.46	2.51				
D185608	16.5	.47	.99	1.70	0.	1,100	1,150	1,215
	---	.60	1.25	2.15				
	---	.69	1.46	2.51				
D211755	4.7	.01	2.37	1.04	0.	1,080	1,125	1,190
	---	.01	2.60	1.14				
	---	.01	3.10	1.36				
D211756	3.7	.01	1.37	1.55	0.	1,075	1,120	1,175
	---	.01	1.49	1.68				
	---	.01	1.62	1.83				
D211757	3.1	.70	2.57	3.88	0.	1,060	1,125	1,175
	---	.74	2.73	4.13				
	---	.88	3.24	4.89				
D211758	5.2	.97	6.54	2.86	0.	1,075	1,125	1,175
	---	1.06	7.15	3.13				
	---	1.33	8.98	3.93				
D211759	8.4	.82	4.49	1.59	0.	1,050	1,100	1,160
	---	.92	5.06	1.79				
	---	1.15	6.30	2.23				

Table 2b. (cont'd.) Proximate and ultimate analyses, heat of combustion, forms of sulfur, free-swelling index, and ash-fusion temperature determinations for Iowa coal samples.

Sample Number	Proximate Analysis				Ultimate Analysis					Heat of Combustion	
	Moisture	Volatile Matter	Fixed Carbon	Ash	Hydrogen	Carbon	Nitrogen	Oxygen	Sulfur	Kcal/kg	Btu/lb
D211760	12.7	24.8	29.2	33.3	4.5	37.5	0.8	19.5	4.3	3,800	6,840
	---	28.4	33.4	38.1	3.5	43.0	.9	9.4	4.9	4,350	7,830
	---	45.9	54.1	---	5.7	69.4	1.5	15.2	8.0	7,030	12,660

Sample Number	Air-dried Loss	Forms of Sulfur			Free Swelling Index	Ash Fusion Temperature, °C		
		Sulfate	Pyritic	Organic		Initial Deformation	Softening	Fluid
D211760	10.0	0.87	3.07	0.39	0.	1,225	1,290	1,340
	---	1.00	3.52	.45				
	---	1.61	5.69	.72				

Table 2c. Major- and minor-oxides concentrations in the laboratory ash of Iowa samples.

[Values in percent. Coal ashed at 525 °C. B means not determined; L, less than value shown.]

Sample Number	Ash (percent)	SiO_2 (percent)	Al_2O_3 (percent)	CaO (percent)	MgO (percent)	Na_2O (percent)	K_2O (percent)	Fe_2O_3 (percent)	TiO_2 (percent)	P_2O_5 (percent)	SO_3 (percent)	Sample Number
D211729	29.9	B	B	B	B	B	B	B	B	B	B	D211729
D211761	15.9	24	13	2.0	.36	.15	.97	50	.64	.063L	B	D211761
D211730	49.4	B	B	B	B	B	B	B	B	B	B	D211730
D211731	23.5	B	B	B	B	B	B	B	B	B	B	D211731
D211732	32.0	B	B	B	B	B	B	B	B	B	B	D211732
D211733	16.9	B	B	B	B	B	B	B	B	B	B	D211733
D211734	28.4	B	B	B	B	B	B	B	B	B	B	D211734
D211735	22.9	B	B	B	B	B	B	B	B	B	B	D211735
D211736	21.5	B	B	B	B	B	B	B	B	B	B	D211736
D211728	28.3	B	B	B	B	B	B	B	B	B	B	D211728
D166022	B	36	19	.87	.75	.12	1.9	13	B	B	23	D166022
D166023	B	30	18	.10L	.58	.09	1.6	7.7	B	B	13	D166023
D166024	B	32	13	2.7	.53	.09	1.3	11	B	B	22	D166024
D211752	62.7	45	25	.98	1.0	.21	2.5	14	.75	.26	B	D211752
D211753	25.9	36	21	6.4	.44	.13	.89	20	1.0	.46	B	D211753
D211754	20.9	15	8.1	20	.44	.14	.66	29	.35	.096	B	D211754
D185607	13.1	34	11	11	1.4	.16	1.3	24	1.0	1.0L	15	D185607
D185608	13.1	34	11	11	1.4	.16	1.3	24	1.0	1.0L	15	D185608
D211717	31.2	B	B	B	B	B	B	B	B	B	B	D211717
D211718	23.1	B	B	B	B	B	B	B	B	B	B	D211718
D211719	32.4	B	B	B	B	B	B	B	B	B	B	D211719
D186077	72.1	.5L	.5L	.81	.01L	.06	.77	73	.05L	1.0L	22	D186077
D166025	B	58	21	.13	1.3	.17	2.9	7.8	B	B	4.5	D166025
D211755	16.3	16	3.8	21	.42	.07	.28	33	.15	.49	B	D211755
D211756	10.9	24	4.3	24	.30	.09	.35	21	.17	.37	B	D211756
D211757	17.3	16	8.9	21	.47	.14	.60	26	.35	.17	B	D211757
D211720	26.2	B	B	B	B	B	B	B	B	B	B	D211720
D166026	B	64	18	.37	.90	.13	2.4	5.4	B	B	6.0	D166026
D211758	20.0	16	11	6.7	.17	.12	.35	51	.38	.30	B	D211758
D211759	19.8	16	7.2	18	.27	.22	.50	36	.32	.10	B	D211759
D211760	36.3	47	25	1.4	1.0	.37	2.8	17	.72	.083	B	D211760
D211721	41.8	B	B	B	B	B	B	B	B	B	B	D211721
D211722	14.6	B	B	B	B	B	B	B	B	B	B	D211722
D211723	25.3	B	B	B	B	B	B	B	B	B	B	D211723
D211724	18.1	B	B	B	B	B	B	B	B	B	B	D211724
D211725	16.0	B	B	B	B	B	B	B	B	B	B	D211725
D211726	12.9	B	B	B	B	B	B	B	B	B	B	D211726
D211727	30.2	B	B	B	B	B	B	B	B	B	B	D211727
D211716	35.6	B	B	B	B	B	B	B	B	B	B	D211716

Table 2d. Major-, minor-, and trace-element concentrations of Iowa samples.

[Values in percent or parts-per-million. Elements not determined on whole coal have been calculated from analyses of ash. S means analysis by six-step emission spectrography; L, less than the value shown; B, not determined; N, not detected.]

Sample Number	Si (percent)	Al (percent)	Ca (percent)	Mg (percent)	Na (percent)	K (percent)	Fe (percent)	Ti (percent)	Ag-S (ppm)	As (ppm)	Sample Number
D211729	B	B	B	B	B	B	B	B	N	B	D211729
D211761	1.7	1.1	.22	.034	.017	.13	5.6	.061	.48	100	D211761
D211730	B	B	B	B	B	B	B	B	N	B	D211730
D211731	B	B	B	B	B	B	B	B	N	B	D211731
D211732	B	B	B	B	B	B	B	B	N	B	D211732
D211733	B	B	B	B	B	B	B	B	N	B	D211733
D211734	B	B	B	B	B	B	B	B	N	B	D211734
D211735	B	B	B	B	B	B	B	B	N	B	D211735
D211736	B	B	B	B	B	B	B	B	N	B	D211736
D211728	B	B	B	B	B	B	B	B	N	B	D211728
D166022	B	B	B	B	.089	B	B	B	N	50	D166022
D166023	B	B	B	B	.067	B	B	B	N	15	D166023
D166024	B	B	B	B	.067	B	B	B	N	35	D166024
D211752	13	8.2	.44	.39	.099	1.3	6.0	.28	N	72	D211752
D211753	4.4	2.8	1.2	.068	.025	.19	3.6	.16	.26	15	D211753
D211754	1.5	.90	2.9	.055	.022	.12	4.2	.044	N	6.0	D211754
D185607	2.1	.76	1.0	.11	.016	.14	2.2	.078	N	6.6	D185607
D185608	2.1	.76	1.0	.11	.016	.14	2.2	.078	N	6.6	D185608
D211717	B	B	B	B	B	B	B	B	1.6	B	D211717
D211718	B	B	B	B	B	B	B	B	1.2	B	D211718
D211719	B	B	B	B	B	B	B	B	N	B	D211719
D186077	.17L	.19L	.42	.004L	.032	.46	37	.022L	N	400	D186077
D166025	B	B	B	B	.13	B	B	B	N	15	D166025
D211755	1.3	.33	2.4	.041	.008	.038	3.7	.015	N	24	D211755
D211756	1.2	.25	1.9	.020	.008	.032	1.6	.011	N	17	D211756
D211757	1.3	.81	2.6	.049	.018	.087	3.1	.036	N	3.4	D211757
D211720	B	B	B	B	B	B	B	B	N	B	D211720
D166026	B	B	B	B	.096	B	B	B	N	12	D166026
D211758	1.5	1.1	.96	.020	.017	.058	7.2	.046	N	20	D211758
D211759	1.4	.75	2.6	.032	.032	.083	4.9	.038	N	12	D211759
D211760	8.0	4.7	.36	.22	.099	.84	4.4	.16	.36L	72	D211760
D211721	B	B	B	B	B	B	B	B	N	B	D211721
D211722	B	B	B	B	B	B	B	B	1.0	B	D211722
D211723	B	B	B	B	B	B	B	B	1.8	B	D211723
D211724	B	B	B	B	B	B	B	B	N	B	D211724
D211725	B	B	B	B	B	B	B	B	N	B	D211725
D211726	B	B	B	B	B	B	B	B	.90	B	D211726
D211727	B	B	B	B	B	B	B	B	N	B	D211727
D211716	B	B	B	B	B	B	B	B	N	B	D211716

Table 2d. (cont'd.) Major-, minor-, and trace-element concentrations of Iowa samples.

Sample Number	B-S (ppm)	Ba-S (ppm)	Be-S (ppm)	Cd (ppm)	Ce (ppm)	Cl (ppm)	Co (ppm)	Cr (ppm)	Cu (ppm)	F (ppm)	Sample Number
D211729	21	21	2.1	0.30L	N	B	B	B	B	B	D211729
D211761	48	16	2.4	.16L	N	100	17	19	45	40	D211761
D211730	49	250	1.5	.49L	N	B	B	B	B	B	D211730
D211731	47	1,600	.71	.24	N	B	B	B	B	B	D211731
D211732	32	96	.96	2.9	N	B	B	B	B	B	D211732
D211733	34	17	.85	.17L	N	B	B	B	B	B	D211733
D211734	57	140	1.4	1.1	N	B	B	B	B	B	D211734
D211735	69	160	1.1	14	160	B	B	B	B	B	D211735
D211736	43	32	1.5	.22L	110	B	B	B	B	B	D211736
D211728	28	140	.85	13	N	B	B	B	B	B	D211728
D166022	B	B	B	B	B	B	B	B	B	750	D166022
D166023	B	B	B	B	B	B	B	B	B	490	D166023
D166024	B	B	B	B	B	B	B	B	B	450	D166024
D211752	63	940	1.9	6.9	310L	100	22	77	48	480	D211752
D211753	52	39	2.6	.26L	130L	100	12	47	31	95	D211753
D211754	42	100	.63	.21L	N	200	6.1	11	8.2	150	D211754
D185607	92	260	2.0	.52	92	B	7.6	19	16	95	D185607
D185608	92	260	2.0	.52	92	B	7.6	19	16	95	D185608
D211717	47	47	3.1	.31L	N	B	B	B	B	B	D211717
D211718	46	460	1.2	.46	N	B	B	B	B	B	D211718
D211719	65	65	1.6	91	490	B	B	B	B	B	D211719
D186077	36L	3.6	N	.72	N	B	N	1.3	29	20L	D186077
D166025	B	B	B	B	B	B	B	B	B	550	D166025
D211755	49	11	1.6	.16L	N	100	2.7	4.6	15	110	D211755
D211756	76	7.6	1.6	.11L	N	200	2.9	6.9	8.7	65	D211756
D211757	52	12	1.2	.17L	N	200	4.5	17	9.3	110	D211757
D211720	26	7.9	.79	.26L	N	B	B	B	B	B	D211720
D166026	B	B	B	B	B	B	B	B	B	780	D166026
D211758	30	14	1.4	.20L	N	200	7.5	16	13	70	D211758
D211759	59	14	.59	.20L	N	300	7.5	12	11	50	D211759
D211760	73	110	1.1	.36L	180L	400	18	52	64	220	D211760
D211721	42	21	1.3L	.84	N	B	B	B	B	B	D211721
D211722	73	73	4.4	3.8	73L	B	B	B	B	B	D211722
D211723	38	38	N	78	N	B	B	B	B	B	D211723
D211724	36	13	.54	.72	N	B	B	B	B	B	D211724
D211725	32	80	.80	67	N	B	B	B	B	B	D211725
D211726	64	26	1.9	.13L	N	B	B	B	B	B	D211726
D211727	60	91	1.5	.30L	N	B	B	B	B	B	D211727
D211716	71	71	3.6	3.9	N	B	B	B	B	B	D211716

Table 2d. (cont'd.) Major-, minor-, and trace-element concentrations of Iowa samples.

Sample Number	Ga-S (ppm)	Ge-S (ppm)	Hg (ppm)	La (ppm)	Li (ppm)	Mn (ppm)	Mo-S (ppm)	Nb-S (ppm)	Nd-S (ppm)	Ni-S (ppm)	Sample Number
D211729	B	6.0	B	N	B	B	3.0	N	B	45	D211729
D211761	4.8	24	.24	16L	17	39	2.4	3.2L	N	24	D211761
D211730	15	9.9	B	49L	B	B	N	9.9L	N	49	D211730
D211731	7.1	16	B	N	B	B	4.7	N	B	12	D211731
D211732	B	16	B	32	B	B	N	N	64	64	D211732
D211733	5.1	17	B	N	B	B	N	N	B	25	D211733
D211734	8.5	20	B	N	B	B	N	5.7L	B	57	D211734
D211735	11	34	B	69	B	B	N	N	160	34	D211735
D211736	6.5	22	B	43	B	B	N	N	64	22	D211736
D211728	B	28	B	N	B	B	5.7	N	B	85	D211728
D166022	B	N	.090	B	B	B	B	B	B	B	D166022
D166023	B	N	.060	B	B	B	N	B	N	B	D166023
D166024	B	N	.15	B	B	B	B	B	N	B	D166024
D211752	19	19	.18	63L	82	88	4.4	13L	94L	94	D211752
D211753	7.8	13	.25	52	57	200	1.8L	5.2L	52	39	D211753
D211754	6.3	15	.10	N	6.3	250	N	N	B	10	D211754
D185607	3.9	20	.16	26	14	210	1.3	2.6	39	13	D185607
D185608	3.9	20	.16	26	14	210	1.3	2.6	39	13	D185608
D211717	B	22	B	N	B	B	N	N	B	94	D211717
D211718	6.9	23	B	N	B	B	N	N	B	69	D211718
D211719	23	97	B	230	B	B	N	N	230	65	D211719
D186077	B	72	4.7	N	7.2L	63	N	14L	B	22	D186077
D166025	B	N	.050	B	B	B	N	B	B	B	D166025
D211755	4.9	16	.13	N	1.6L	290	N	N	B	24	D211755
D211756	3.3	16	.10	N	1.1L	150	N	N	B	16	D211756
D211757	5.2	12	.11	N	6.9	580	1.2	N	B	8.7	D211757
D211720	7.9	26	B	N	B	B	N	N	B	79	D211720
D166026	B	N	.060	B	B	B	B	B	B	B	D166026
D211758	B	10	.15	20L	16	95	2.0	4.0L	30	14	D211758
D211759	B	14	.16	N	4.8	240	2.0	N	B	14	D211759
D211760	11	11	.13	36L	44	65	2.5L	7.3L	54L	54	D211760
D211721	13	42	B	N	B	B	4.2	N	B	63	D211721
D211722	10	22	B	44	B	B	4.4	2.9L	29	29	D211722
D211723	13	38	B	N	B	B	7.6	N	B	130	D211723
D211724	9.1	27	B	N	B	B	N	N	B	54	D211724
D211725	8.0	16	B	N	B	B	3.2	N	B	32	D211725
D211726	6.5	13	B	26	B	B	13	N	N	64	D211726
D211727	15	15	B	30L	B	B	N	6.0L	N	60	D211727
D211716	11	7.1	B	36L	B	B	N	7.1L	N	53	D211716

Table 2d. (cont'd.) Major-, minor-, and trace-element concentrations of Iowa samples.

Sample Number	P (ppm)	Pb (ppm)	Pr-S (ppm)	Sb (ppm)	Sc (ppm)	Se (ppm)	Sr-S (ppm)	Th (ppm)	U (ppm)	V-S (ppm)	Sample Number
D211729	B	120	B	B	6.0	B	21	B	B	45	D211729
D211761	44L	230	N	10	3.2	4.9	16	2.3	2.9	24	D211761
D211730	B	61	N	B	9.9	B	250	B	B	99	D211730
D211731	B	12	B	B	3.5	B	70	B	B	35	D211731
D211732	B	22	N	B	4.8	B	320	B	B	48	D211732
D211733	B	20	B	B	3.4	B	34	B	B	25	D211733
D211734	B	37	B	B	5.7	B	85	B	B	57	D211734
D211735	B	6.4	N	B	11	B	690	B	B	46	D211735
D211736	B	75	N	B	3.2	B	430	B	B	32	D211736
D211728	B	59	B	B	2.8	B	14	B	B	20	D211728
D166022	B	B	N	1.1	B	1.7	B	16	5.3	B	D166022
D166023	B	B	N	1.4	B	4.0	B	12	7.6	B	D166023
D166024	B	B	N	2.0	B	17	B	21	30	B	D166024
D211752	700	88	N	2.0	13	1.9	190	7.7	4.5	94	D211752
D211753	520	42	N	N	7.8	8.8	180	5.0	5.8	39	D211753
D211754	87	42	B	.074	2.1	1.2	21	1.3	1.8	15	D211754
D185607	570L	30	B	.20	3.9	4.2	130	3.8	B	26	D185607
D185608	570L	30	B	.20	3.9	4.2	130	3.8	B	26	D185608
D211717	B	56	B	B	9.4	B	31	B	B	62	D211717
D211718	B	55	B	B	4.6	B	160	B	B	46	D211718
D211719	B	60	65	B	9.7	B	1,600	B	B	49	D211719
D186077	3,200L	700	B	N	N	2.7	5.0	N	1.0L	N	D186077
D166025	B	B	N	.50	B	.50	B	15	4.0	B	D166025
D211755	350	32	B	.91	2.4	1.5	16	.47	1.7	4.9	D211755
D211756	170	12	B	.99	1.1	1.3	16	.41	1.6	16	D211756
D211757	130	6.2	B	.37	1.7	2.6	26	1.2	3.4	17	D211757
D211720	B	29	B	B	2.6	B	79	B	B	18	D211720
D166026	B	B	N	.40	B	2.0	B	13	6.2	B	D166026
D211758	260	8.6	N	.080	3.0	4.4	60	1.6	4.1	30	D211758
D211759	87	170	B	.20	2.0	2.9	14	1.2	2.1	14	D211759
D211760	130	59	N	2.7	7.3	4.7	110	6.2	5.2	54	D211760
D211721	B	210	B	B	4.2L	B	63	B	B	29	D211721
D211722	B	12	N	B	10	B	220	B	B	100	D211722
D211723	B	94	B	B	5.1	B	13	B	B	51	D211723
D211724	B	63	B	B	2.7	B	13	B	B	18	D211724
D211725	B	38	B	B	2.4	B	32	B	B	24	D211725
D211726	B	18	N	B	3.9	B	64	B	B	39	D211726
D211727	B	8.5	N	B	6.0	B	150	B	B	60	D211727
D211716	B	47	N	B	11	B	71	B	B	71	D211716

Table 2d. (cont'd.) Major-, minor-, and trace-element concentrations of Iowa samples.

Sample Number	Y-S (ppm)	Yb (ppm)	Zn (ppm)	Zr-S (ppm)
D211729	6.0	B	20	30
D211761	8.0	B	72	24
D211730	15	2.5	33	49
D211731	12	1.2	64	12
D211732	32	B	1,000	22
D211733	8.5	B	10	8.5
D211734	14	B	210	20
D211735	16	B	1,900	16
D211736	11	B	16	11
D211728	14	B	1,500	N
D166022	B	B	B	B
D166023	B	B	B	B
D166024	B	B	B	B
D211752	13	1.9	750	63
D211753	13	1.3	1,100	39
D211754	6.3	B	85	15
D185607	20	B	140	20
D185608	20	B	140	20
D211717	16	B	17	47
D211718	6.9	B	190	23
D211719	16	B	11,000	49
D186077	N	B	25	N
D166025	B	B	B	B
D211755	8.2	B	140	4.9
D211756	5.5	B	580	7.6
D211757	5.2	B	61	12
D211720	5.2	B	19	N
D166026	B	B	B	B
D211758	14	B	1,000	14
D211759	5.9	B	13	14
D211760	7.3	1.1	26	54
D211721	8.4	B	30	42
D211722	15	1.5	580	29
D211723	7.6	B	5,100	25
D211724	3.6	B	45	9.1
D211725	4.8	B	4,700	24
D211726	6.5	.90	14	13
D211727	9.1	.91	53	30
D211716	18	2.5	310	71

KANSAS

In Kansas, the Cherokee, Kansas City and Douglas Groups are represented in USCHEM by 41, 3, and 1 coal sample(s), respectively (Figure 6). A total of nine different beds have been sampled in these units (collecting localities shown in Figure 7). References that contain USCHEM data include: Swanson and others (1976) and Hatch and others (1976). Data in Tables 3a through 3d are for three samples from the Cherokee Group (Tables 3b and 3c are blank because proximate, ultimate, and ash oxide analyses were not performed on these samples).

SERIES	GROUP	BED
Virgil	Wabaunsee	
	Shawnee	
	Douglas	Upper Williamsburg
Missouri	Pedee	
	Lansing	
	Kansas City	Thayer
	Bronson	
	Bourbon	
Des Moines	**Marmaton**	
	Cherokee	**Mulky Bevier Crowęburg Fleming Mineral Drywood Rowe**

Figure 6. Stratigraphic column of coal-bearing units in Kansas; units that are represented in USCHEM are shown in bold type.

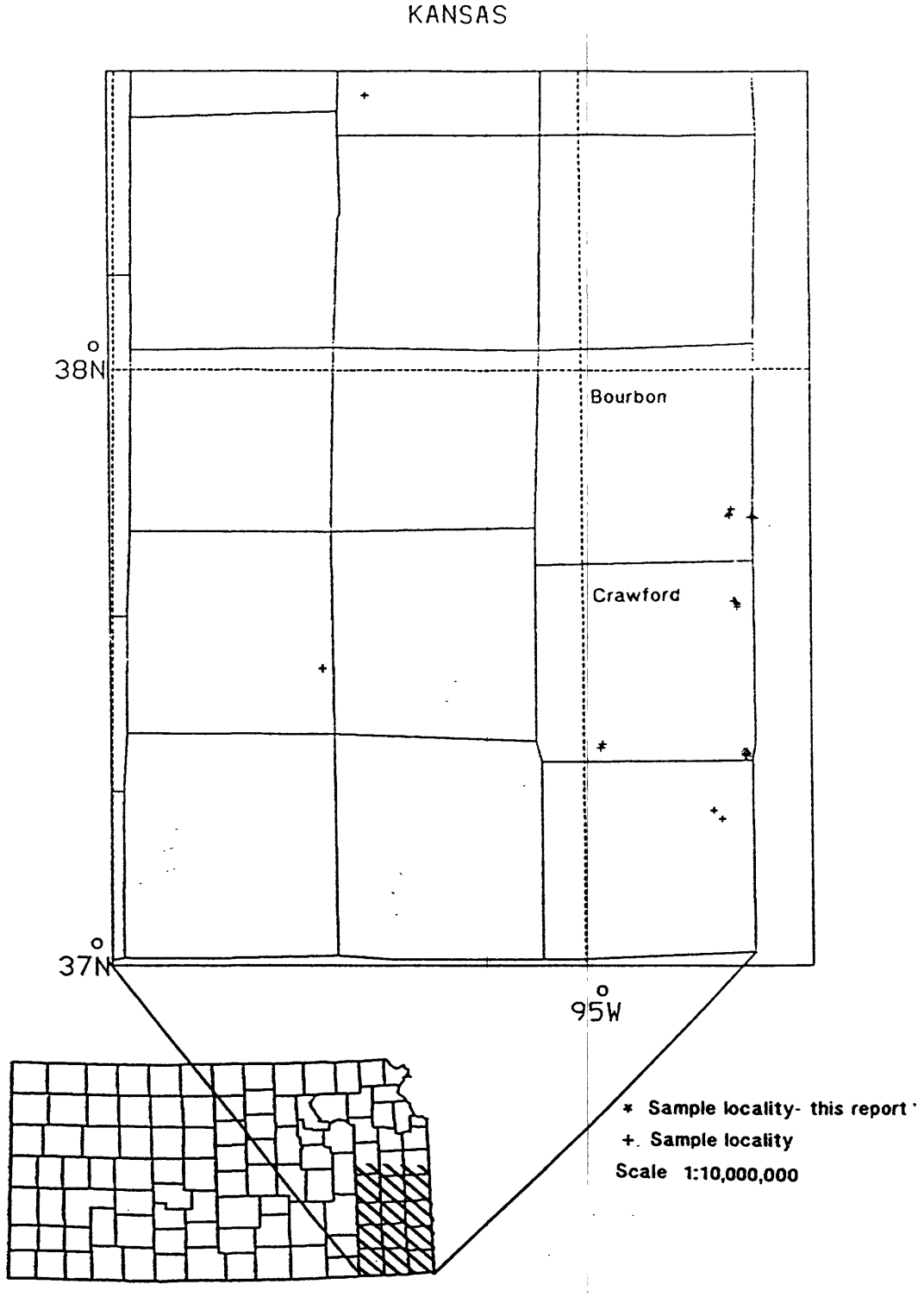

Figure 7. Collecting localities for USCHEM coal samples in Kansas. County boundaries are indicated.

Table 3a. Sample information for USCHEM data in Kansas.

[NDE means no data entered. Depth is the interval to the top of the sample. For channel samples depth is usually 0.0 (except where collected in benched intervals); for cored samples depth is measured from the top of the core.]

Sample Number	State	County	Latitude	Longitude	Quadrangle	Location/Source
D186706	KANSAS	BOURBON	374507 N	943745 W	FORT SCOTT (7.5')	BILLS COAL CO,FT SCOTT MINE
D186704	KANSAS	CRAWFORD	372117 N	943856 W	KIRKWOOD (7.5')	CLEMENS NO 25 MINE
D186705	KANSAS	CRAWFORD	372117 N	943850 W	KIRKWOOD (7.5')	CLEMENS NO 25 MINE

Sample Number	Field Id No.	Collector	Formation	Group	Bed Name	Zone
D186706	B-F-3-76	KSGS-BRADY L L	CABANISS	CHEROKEE	FLEMING	NDE
D186704	B-D-6-76	KSGS-BRADY L L	KREBS	CHEROKEE	DRYWOOD	NDE
D186705	B-D-5-76	KSGS-BRADY L L	KREBS	CHEROKEE	DRYWOOD	NDE

Sample Number	Depth (feet)	Sample Thickness (feet)	Analytical Labs	Sample Type	Data Values Represent	Estimated Rank	Field
D186706	0.0	1.2	US GEOL. SURVEY	CHANNEL	SINGLE SAMPLE	BITUMINOUS	NDE
D186704	NDE	NDE	US GEOL. SURVEY	GRAB	SINGLE SAMPLE	BITUMINOUS	NDE
D186705	0.0	1.2	US GEOL. SURVEY	CHANNEL	SINGLE SAMPLE	BITUMINOUS	NDE

Table 3b. Proximate and ultimate analyses, heat of combustion, forms of sulfur, free-swelling index, and ash-fusion temperature determinations for Kansas coal samples.

Sample Number	Proximate Analysis: Moisture	Volatile Matter	Fixed Carbon	Ash	Ultimate Analysis: Hydrogen	Carbon	Nitrogen	Oxygen	Sulfur	Heat of Combustion: Kcal/kg	Btu/lb
D186706 D186704 D186705	[Proximate and ultimate analyses not performed on these samples.]										

Sample Number	Air-dried Loss	Forms of Sulfur: Sulfate	Pyritic	Organic	Free Swelling Index	Ash Fusion Temperature, °C: Initial Deformation	Softening	Fluid
D186706 D186704 D186705	[Proximate and ultimate analyses not performed on these samples.]							

Table 3c. Major- and minor-oxides concentrations in the laboratory ash of Kansas samples.
[Values in percent. Coal ashed at 525 °C.]

Sample Number	Ash (percent)	SiO_2 (percent)	Al_2O_3 (percent)	CaO (percent)	MgO (percent)	Na_2O (percent)	K_2O (percent)	Fe_2O_3 (percent)	TiO_2 (percent)	P_2O_5 (percent)	SO_3 (percent)	Sample Number
D186706 D186704 D186705	12.7 18.9 22.1	[Ash oxides not determined on these samples.]										D186706 D186704 D186705

Table 3d. Major-, minor-, and trace-element concentrations of Kansas samples.

[Values in parts-per-million. Elements not determined on whole coal have been calculated from analyses of ash. S means analysis by six-step emission spectrography; L, less than the value shown; B, not determined; N, not detected.]

Sample Number	Ag-S (ppm)	As (ppm)	B-S (ppm)	Ba-S (ppm)	Be-S (ppm)	Cd (ppm)	Co (ppm)	Cr (ppm)	Sample Number
D186706	0.19	18	19	38	0.89	27	8.9	3.8	D186706
D186704	N	14	19	28	1.3	.19L	19	9.5	D186704
D186705	N	29	11	44	1.1	.22L	15	6.6	D186705

Sample Number	Ge-S (ppm)	Hg (ppm)	Mo-S (ppm)	Nb-S (ppm)	Ni-S (ppm)	Pb (ppm)	Sb (ppm)	Sc (ppm)	Sample Number
D186706	13	0.040	1.9	2.5L	25	65	B	1.9	D186706
D186704	5.7	.18	N	3.8	57	140	B	2.8	D186704
D186705	4.4L	.10	1.5	4.4L	66	170	B	3.3	D186705

Sample Number	Se (ppm)	Sr-S (ppm)	V-S (ppm)	Y-S (ppm)	Zn (ppm)	Zr-S (ppm)	Sample Number
D186706	B	25	8.9	8.9	3,200	8.9	D186706
D186704	B	28	13	9.5	26	13	D186704
D186705	B	33	15	6.6	19	15	D186705

MISSOURI

Swanson and others (1976), Hatch and others (1976), and Wedge and Hatch (1980) have published data for most of the 138 USCHEM Missouri coal samples. Data for 11 samples (9 of which are non-coal material) are included in Tables 4a through 4d. The Pennsylvanian-age coal-bearing groups in Missouri have been divided into subgroups (Figure 8). The vast majority of USCHEM samples are from the Cabaniss and Appanoose subgroups. Sampling localities are shown on Figure 9.

SERIES	GROUP	SUBGROUP	BED
Des Moines	Marmaton	Appanoose	Mulberry Lexington
		Fort Scott	Summit
	Cherokee	Cabaniss	Mulky Bevier Wheeler Croweburg Tebo Weir-Pittsburg
		Krebs	Drywood Rowe

Figure 8. Stratigraphic column for coal-bearing units in Missouri that are represented in the USCHEM data base.

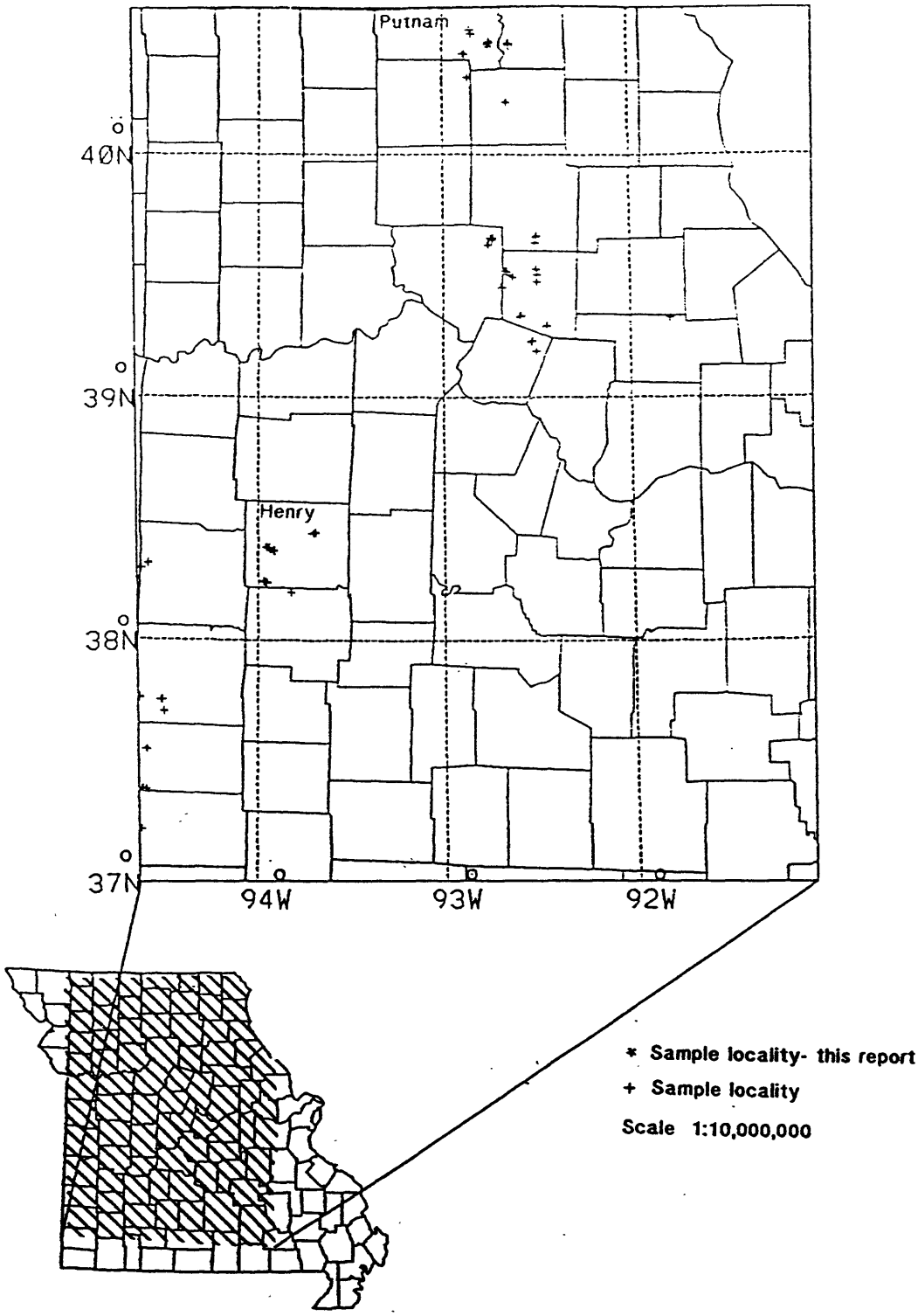

Figure 9. Collecting localities for USCHEM coal samples in Missouri. County boundaries are indicated.

Table 4a. Sample information for USCHEM data in Missouri.

[NDE means no data entered. Depth is the interval to the top of the sample. For channel samples depth is usually 0.0 (except where collected in benched intervals); for cored samples depth is measured from the top of the core.]

Sample Number	State	County	Latitude	Longitude	Quadrangle	Location/Source
D179986	MISSOURI	HENRY	382250 N	935640 W	HARTWELL (7.5')	NDE
D179987	MISSOURI	HENRY	382250 N	935640 W	HARTWELL (7.5')	NDE
D185646	MISSOURI	HENRY	381440 N	935800 W	MONEGAW SPRINGS NW (7.5')	POWER MINE
D179998	MISSOURI	NDE	NDE	NDE	NDE	NDE
D185643	MISSOURI	PUTNAM	403000 N	925030 W	GREEN CITY (15')	MISSOURI MINING CO
D185644	MISSOURI	PUTNAM	403100 N	925100 W	OMAHA (7.5')	MISSOURI MINING CO
D185645	MISSOURI	PUTNAM	402720 N	924505 W	GREEN CITY (15')	MISSOURI MINING CO
D179404	MISSOURI	PUTNAM	402805 N	924450 W	LIVONIA (7.5')	NDE
D179405	MISSOURI	PUTNAM	402805 N	924450 W	LIVONIA (7.5')	NDE
D179406	MISSOURI	PUTNAM	402507 N	925318 W	UNIONVILLE EAST (7.5 ')	NDE
D179407	MISSOURI	PUTNAM	402805 N	924450 W	LIVONIA (7.5')	NDE

Sample Number	Field Id No.	Collector	Formation	Group	Bed Name	Zone
D179986	X-6	MDNR-RUEFF A W	NDE	APPANOOSE	MULBERRY	NDE
D179987	X-8	MDNR-RUEFF A W	NDE	APPANOOSE	LEXINGTON	NDE
D185646	M-7-76	USGD-SWANSON V E	NDE	CABANISS	TEBO	OVERBURDEN
D179998	X-7	MDNR-RUEFF A W	NDE	NDE	NDE	NDE
D185643	M-1-76	USGD-SWANSON V E	NDE	APPANOOSE	LEXINGTON	OVERBURDEN
D185644	M-2-76	USGD-SWANSON V E	NDE	APPANOOSE	LEXINGTON	NDE
D185645	M-5-76	USGD-SWANSON V E	NDE	APPANOOSE	LEXINGTON	NDE
D179404	X-1A	MDNR-RUEFF A W	NDE	NDE	NDE	NDE
D179405	X-2	MDNR-RUEFF A W	NDE	NDE	NDE	NDE
D179406	X-3	MDNR-RUEFF A W	NDE	APPANOOSE	LEXINGTON	NDE
D179407	X-1B	MDNR-RUEFF A W	NDE	NDE	NDE	NDE

Table 4a. (cont'd.) Sample information for USCHEM data in Missouri.

Sample Number	Depth (feet)	Sample Thickness (feet)	Analytical Labs	Sample Type	Data Values Represent	Estimated Rank	Field
D179986	0.0	0.0	US BUR. MINES/US GEOL. SURVEY	OTHER	SINGLE SAMPLE	BITUMINOUS	NDE
D179987	0.0	0.0	US BUR. MINES/US GEOL. SURVEY	OTHER	SINGLE SAMPLE	BITUMINOUS	NDE
D185646	NDE	NDE	US GEOL. SURVEY	GRAB	SINGLE SAMPLE	SHALE	NDE
D179998	NDE	NDE	US GEOL. SURVEY	GRAB	SINGLE SAMPLE	LIMESTONE	NDE
D185643	NDE	NDE	US GEOL. SURVEY	GRAB	SINGLE SAMPLE	SHALE	NDE
D185644	NDE	NDE	US GEOL. SURVEY	GRAB	SINGLE SAMPLE	SHALE	NDE
D185645	NDE	NDE	US GEOL. SURVEY	GRAB	SINGLE SAMPLE	SHALE	NDE
D179404	NDE	NDE	US GEOL. SURVEY	GRAB	SINGLE SAMPLE	CARBONACEOUS SHALE	NDE
D179405	NDE	NDE	US GEOL. SURVEY	GRAB	SINGLE SAMPLE	UNKNOWN	NDE
D179406	NDE	NDE	US GEOL. SURVEY	GRAB	SINGLE SAMPLE	PYRITE ZONE	NDE
D179407	NDE	NDE	US GEOL. SURVEY	GRAB	SINGLE SAMPLE	CARBONACEOUS SHALE	NDE

Table 4b. Proximate and ultimate analyses, heat of combustion, forms of sulfur, free-swelling index, and ash-fusion temperature determinations for Missouri coal samples.

[All analyses in percent except Kcal/kg, Btu/lb, free-swelling index, and ash-fusion temperatures. For each sample number, the analyses are reported three ways: first, as received (moisture included in H and O); second, moisture-free; and third, moisture- and ash-free. Analyses are by a commercial testing laboratory following ASTM standards.]

	Proximate Analysis				Ultimate Analysis					Heat of Combustion	
Sample Number	Moisture	Volatile Matter	Fixed Carbon	Ash	Hydrogen	Carbon	Nitrogen	Oxygen	Sulfur	Kcal/kg	Btu/lb
D179986	9.4	26.3	38.0	26.3	4.5	49.7	0.9	14.2	4.5	4,910	8,840
	---	29.0	41.9	29.0	3.8	54.9	1.0	6.5	5.0	5,420	9,760
	---	40.9	59.1	---	5.4	77.3	1.4	9.1	7.0	7,640	13,750
D179987	15.2	30.2	40.8	13.8	5.5	54.0	1.0	21.3	4.5	5,430	9,780
	---	35.6	48.1	16.3	4.5	63.7	1.2	9.2	5.3	6,410	11,530
	---	42.5	57.5	---	5.4	76.1	1.4	11.0	6.3	7,650	13,770

		Forms of Sulfur				Ash Fusion Temperature, °C		
Sample Number	Air-dried Loss	Sulfate	Pyritic	Organic	Free Swelling Index	Initial Deformation	Softening	Fluid
D179986	6.3	1.57	1.55	1.35	0.	1,120	1,185	1,215
	---	1.73	1.71	1.49				
	---	2.44	2.41	2.10				
D179987	11.1	.60	2.25	1.63	1.0	1,140	1,175	1,225
	---	.71	2.65	1.92				
	---	.85	3.17	2.30				

Table 4c. Major- and minor-oxides concentrations in the laboratory ash of Missouri samples.

[Values in percent. Coal ashed at 525 °C. L means less than value shown.]

Sample Number	Ash (percent)	SiO_2 (percent)	Al_2O_3 (percent)	CaO (percent)	MgO (percent)	Na_2O (percent)	K_2O (percent)	Fe_2O_3 (percent)	TiO_2 (percent)	P_2O_5 (percent)	SO_3 (percent)	Sample Number
D179986	29.7	40	15	7.4	1.1	0.52	2.1	15	0.67	1.0L	9.4	D179986
D179987	12.1	35	16	7.2	.80	.34	1.5	18	.74	1.0L	6.6	D179987
D185646	76.1	41	12	20	2.3	.40	3.4	6.8	.59	7.5	3.0	D185646
D179998	99.7	4.9	.8	47	.47	.03	.11	.6	.05L	1.0L	.41	D179998
D185643	67.5	34	9.5	25	2.2	.43	2.3	7.1	.47	13	4.6	D185643
D185644	70.9	34	8.8	24	2.4	.48	2.3	8.5	.49	11	4.6	D185644
D185645	65.1	33	9.6	27	2.0	.36	2.3	4.5	.50	15	2.3	D185645
D179404	64.5	10	5.3	.37	.25	.10L	.35	68	.30	1.0L	4.6	D179404
D179405	69.8	20	10	17	.42	.15	.72	22	.30	1.0L	7.1	D179405
D179406	70.4	3.5	2.0	.26	.17	.23	.05	67	.14	1.0L	12	D179406
D179407	84.2	57	23	.39	.66	.29	1.7	8.1	1.1	1.0L	2.1	D179407

Table 4d. Major-, minor-, and trace-element concentrations of Missouri samples.

[Values in percent or parts-per-million. Elements not determined on whole coal have been calculated from analyses of ash. S means analysis by six-step emission spectrography; L, less than the value shown; B, not determined; N not detected.]

Sample Number	Si (percent)	Al (percent)	Ca (percent)	Mg (percent)	Na (percent)	K (percent)	Fe (percent)	Ti (percent)	Ag-S (ppm)	As (ppm)	Sample Number
D179986	5.5	2.4	1.6	0.19	0.11	0.52	3.1	0.12	0.59	26	D179986
D179987	2.0	1.0	.62	.058	.030	.15	1.5	.054	.24	9.0	D179987
D185646	15	4.8	11	1.1	.23	2.2	3.6	.27	2.3	15	D185646
D179998	2.3	.41	33	.28	.022	.091	.43	.030L	N	1.0	D179998
D185643	11	3.4	12	.87	.22	1.3	3.3	.19	4.7	26	D185643
D185644	11	3.3	12	1.0	.25	1.4	4.2	.21	2.1	43	D185644
D185645	10	3.3	13	.78	.17	1.2	2.0	.19	3.3	9.0	D185645
D179404	3.0	1.8	.17	.097	.048L	.19	31	.12	1.9	240	D179404
D179405	6.5	3.7	8.5	.18	.078	.42	11	.13	N	110	D179405
D179406	1.2	.74	.13	.072	.12	.030	33	.059	4.9	500	D179406
D179407	22	10	.23	.33	.18	1.2	4.8	.55	1.3	31	D179407

Sample Number	B-S (ppm)	Ba-S (ppm)	Be-S (ppm)	Cd (ppm)	Ce (ppm)	Co (ppm)	Cr (ppm)	Cu (ppm)	F (ppm)	Ga-S (ppm)	Sample Number
D179986	45	89	1.5	25	N	8.9	21	31	190	8.9	D179986
D179987	120	36	1.8	67	N	3.6	24	14	80	8.5	D179987
D185646	110	230	2.3	1.9	380L	11	530	96	7,200	15	D185646
D179998	N	30	N	1.0L	N	N	10	20L	130	N	D179998
D185643	100	200	2.0	74	340L	10	1,000	130	11,000	10	D185643
D185644	110	140	2.1L	18	350L	11	710	95	9,700	11	D185644
D185645	98	200	2.0L	31	330	9.8	980	110	13,000	9.8	D185645
D179404	32	32	N	.65L	N	6.3	16	43	50	B	D179404
D179405	49	1,000	N	140	N	7.2	N	44	150	21	D179405
D179406	35L	21	N	.70L	N	1.6	N	150	20L	B	D179406
D179407	130	590	4.2	.84L	N	7.7	69	44	320	25	D179407

Table 4d. (cont'd.) Major-, minor-, and trace-element concentrations of Missouri samples.

Sample Number	Ge-S (ppm)	Hg (ppm)	La (ppm)	Li (ppm)	Mn (ppm)	Mo-S (ppm)	Nb-S (ppm)	Nd-S (ppm)	Ni-S (ppm)	P (ppm)	Pb (ppm)	Sample Number
D179986	8.9	0.20	N	11	140	5.9	5.9	B	30	1,300L	170	D179986
D179987	18	.18	N	6.4	68	12	2.4	B	12	530L	46	D179987
D185646	N	.24	76	32	410	38	N	110	530	25,000	200	D185646
D179998	N	.050	N	10L	440	N	N	B	5.0	4,400L	25	D179998
D185643	N	.25	100	26	160	47	20	200	470	38,000	100	D185643
D185644	N	.14	110	24	290	50	21	210	350	34,000	190	D185644
D185645	N	.18	130	27	140	46	20	200	460	43,000	150	D185645
D179404	N	3.5	N	12	35	19	9.7	B	45	2,800L	1,500	D179404
D179405	N	.40	N	18	640	35	N	B	49	3,100L	320	D179405
D179406	N	3.0	N	15	28	49	11	B	14	3,100L	1,800	D179406
D179407	N	.57	N	120	76	17	17	B	59	3,700L	240	D179407

Sample Number	Sb (ppm)	Sc (ppm)	Se (ppm)	Sr-S (ppm)	Th (ppm)	U (ppm)	V-S (ppm)	Y-S (ppm)	Yb (ppm)	Zn (ppm)	Zr-S (ppm)	Sample Number
D179986	6.5	4.5	4.0	89	N	7.3	30	15	2.1	1,800	21	D179986
D179987	3.4	3.6	3.8	18	N	5.0	36	8.5	1.2	3,900	12	D179987
D185646	4.2	15	63	150	N	59	230	110	7.6	140	110	D185646
D179998	.60	N	.30	1,000	3.0L	2.6	N	N	N	31	N	D179998
D185643	5.0	10	93	130	N	130	470	130	10	5,600	67	D185643
D185644	5.2	11	76	210	N	80	500	140	7.1	920	71	D185644
D185645	3.1	13	99	200	30	110	650	200	13	2,600	98	D185645
D179404	7.1	N	9.0	3.2L	2.2	.79	N	N	B	31	N	D179404
D179405	5.8	7.0	16	100	3.5	5.2	49	N	B	13,000	35	D179405
D179406	9.9	N	38	7.0	.51	4.0	N	N	B	22	N	D179406
D179407	2.3	13	7.7	59	14	4.3	130	42	5.9	88	130	D179407

NEBRASKA

The coal-bearing units in Nebraska are represented by only 17 samples in the USCHEM data base. Swanson and others (1976) published data for five of these samples. Data for the remaining 12 samples are presented in Tables 5a through 5d. Table 5a indicates that the Nebraska samples were collected by auger or from outcrop locations. The lower heat of combustion values and high moisture values shown in Table 5b indicate that the samples have been weathered. This fact should be remembered when examining the data in all the tables of Nebraska coal quality (Tables 5a through 5d).

Nebraska samples are from five coal beds in the Wabaunsee Group. From oldest to youngest the beds are: Nodaway, Elmo, Wamego, Lorton, and Honey Creek (Figure 10). The collecting localities for these samples are shown in Figure 11.

SERIES	GROUP	FORMATION	BED
Virgil	Wabaunsee	Wood Siding	Honey Creek
		Root	Lorton
		Stotler	
		Pillsbury	
		Zeandale	Wamego
		Willard	
		Emporia	
		Auburn	
		Wakarusa	
		Soldier Creek	
		Burlingame	
		Scranton	Elmo
		Howard	
		Severy	Nodaway

Figure 10. Stratigraphic column for coal-bearing units in Nebraska that are represented in the USCHEM data base.

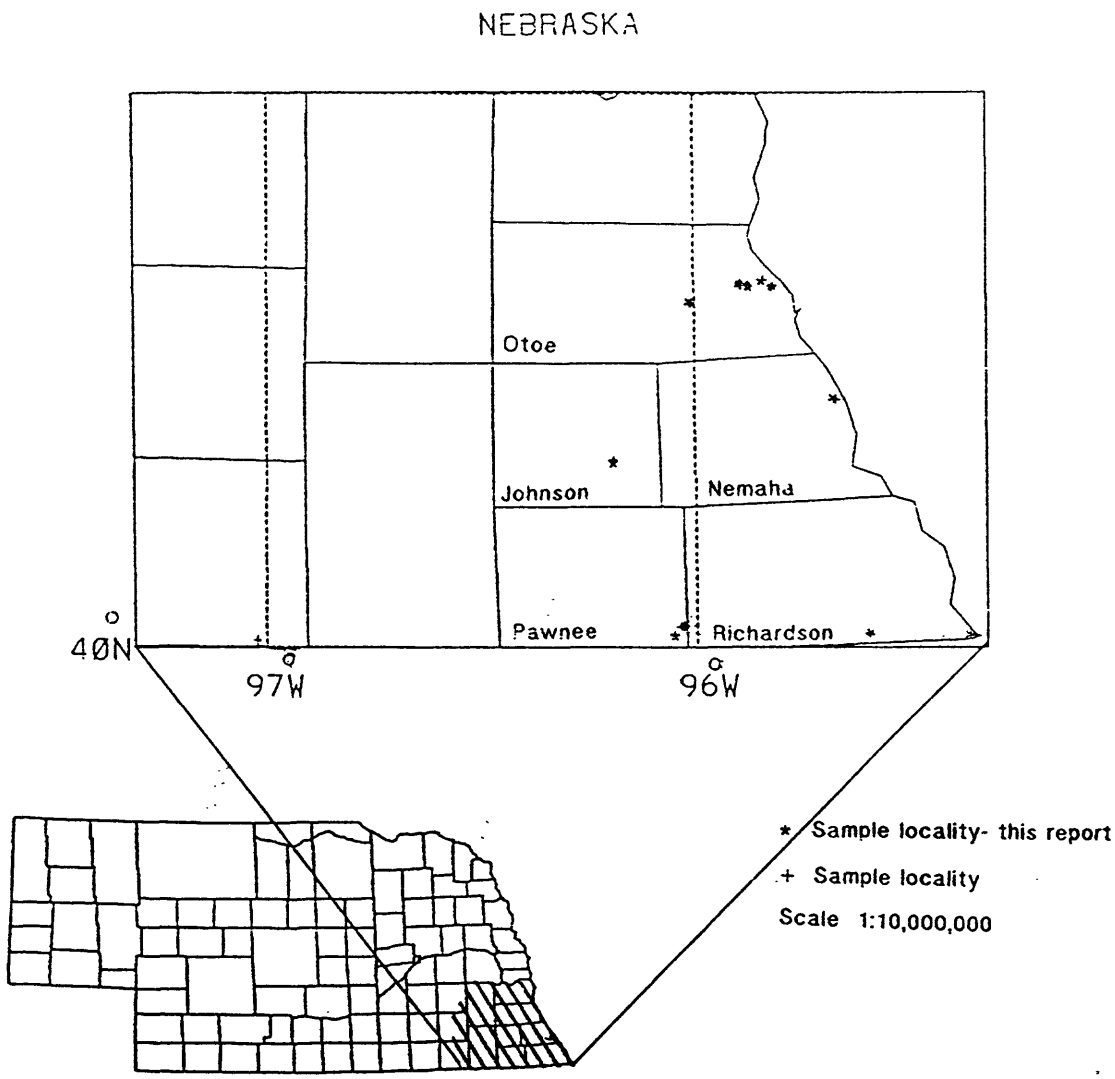

Figure 11. Collecting localities for USCHEM coal samples in Nebraska. County boundaries are indicated.

Table 5a. Sample information for USCHEM data in Nebraska.

[NDE means no data entered. Depth is the interval to the top of the sample. For channel samples depth is usually 0.0 (except where collected in benched intervals); for cored samples depth is measured from the top of the core.]

Sample Number	State	County	Latitude	Longitude	Quadrangle	Location/Source
D192380	NEBRASKA	JOHNSON	402026 N	961118 W	TECUMSEH (7.5')	NDE
D194480	NEBRASKA	JOHNSON	402020 N	961118 W	TECUMSEH (7.5')	NDE
D194484	NEBRASKA	NEMAHA	402656 N	954106 W	PERU (7.5')	NDE
D178625	NEBRASKA	OTOE	403924 N	954902 W	NEBRASKA CITY (7.5')	OUTCROP
D192381	NEBRASKA	OTOE	403730 N	960038 W	TALMAGE (7.5')	NDE
D194481	NEBRASKA	OTOE	403945 N	955325 W	NEBRASKA CITY NW (7.5')	NDE
D194482	NEBRASKA	OTOE	404007 N	955000 W	NEBRASKA CITY NW (7.5')	NDE
D194478	NEBRASKA	PAWNEE	400227 N	960202 W	DUBOIS (7.5')	NDE
D194479	NEBRASKA	PAWNEE	400139 N	960300 W	DUBOIS (7.5')	NDE
D178626	NEBRASKA	RICHARDSON	400144 N	953546 W	FALLS CITY (7.5')	OUTCROP
D178627	NEBRASKA	RICHARDSON	400125 N	952124 W	BIG LAKE (7.5')	OUTCROP
D194483	NEBRASKA	RICHARDSON	400125 N	952124 W	BIG LAKE (7.5')	OUTCROP

Sample Number	Field Id No.	Collector	Formation	Group	Bed Name	Zone
D192380	77-1A	NEGS-KAPLAN S S	ZEANDALE	WABAUNSEE	WAMEGO	NDE
D194480	77-1B	NEGS-KAPLAN S S	ZEANDALE	WABAUNSEE	WAMEGO	NDE
D194484	77-3A	NEGS-KAPLAN S S	WOOD SIDING	WABAUNSEE	HONEY CREEK	NDE
D178625	4-6	NEGS-BURCHETT R R	ZEANDALE	WABAUNSEE	WAMEGO	NDE
D192381	77-2A	NEGS-KAPLAN S S	ROOT	WABAUNSEE	LORTON	NDE
D194481	77-7A	NEGS-KAPLAN S S	ZEANDALE	WABAUNSEE	WAMEGO	NDE
D194482	77-8A	NEGS-KAPLAN S S	ZEANDALE	WABAUNSEE	WAMEGO	NDE
D194478	77-4A	NEGS-KAPLAN S S	SEVERY	WABAUNSEE	NODAWAY	NDE
D194479	77-5A	NEGS-KAPLAN S S	SEVERY	WABAUNSEE	NODAWAY	NDE
D178626	5-88	NEGS-BURCHETT R R	ZEANDALE	WABAUNSEE	WAMEGO	NDE
D178627	5-134	NEGS-BURCHETT R R	SCRANTON	WABAUNSEE	ELMO	NDE
D194483	77-6A	NEGS-KAPLAN S S	SCRANTON	WABAUNSEE	ELMO	NDE

Table 5a. (cont'd.) Sample information for USCHEM data in Nebraska.

Sample Number	Depth (feet)	Sample Thickness (feet)	Analytical Labs	Sample Type	Data Values Represent	Estimated Rank	Field
D192380	0.0	0.8	US BUR. MINES/US GEOL. SURVEY	AUGER	SINGLE SAMPLE	BITUMINOUS	NDE
D194480	0.0	0.8	US BUR. MINES/US GEOL. SURVEY	AUGER	SINGLE SAMPLE	BITUMINOUS	NDE
D194484	0.0	1.8	US BUR. MINES/US GEOL. SURVEY	AUGER	SINGLE SAMPLE	BITUMINOUS	NDE
D178625	0.0	1.1	US BUR. MINES/US GEOL. SURVEY	CHANNEL	SINGLE SAMPLE	BITUMINOUS	NDE
D192381	0.0	0.5	US BUR. MINES/US GEOL. SURVEY	AUGER	SINGLE SAMPLE	BITUMINOUS	NDE
D194481	0.0	0.8	US BUR. MINES/US GEOL. SURVEY	AUGER	SINGLE SAMPLE	BITUMINOUS	NDE
D194482	0.0	0.6	US BUR. MINES/US GEOL. SURVEY	AUGER	SINGLE SAMPLE	BITUMINOUS	NDE
D194478	0.0	1.0	US BUR. MINES/US GEOL. SURVEY	AUGER	SINGLE SAMPLE	BITUMINOUS	NDE
D194479	0.0	1.6	US BUR. MINES/US GEOL. SURVEY	AUGER	SINGLE SAMPLE	BITUMINOUS	NDE
D178626	0.0	0.4	US BUR. MINES/US GEOL. SURVEY	CHANNEL	SINGLE SAMPLE	BITUMINOUS	NDE
D178627	0.0	0.9	US BUR. MINES/US GEOL. SURVEY	CHANNEL	SINGLE SAMPLE	BITUMINOUS	NDE
D194483	0.0	1.0	US BUR. MINES/US GEOL. SURVEY	AUGER	SINGLE SAMPLE	BITUMINOUS	NDE

Table 5b. Proximate and ultimate analyses, heat of combustion, forms of sulfur, free-swelling index, and ash-fusion temperature determinations for Nebraska coal samples.

[All analyses in percent except Kcal/kg, Btu/lb, free-swelling index, and ash-fusion temperatures. For each sample number, the analyses are reported three ways: first, as received (moisture included in H and O); second, moisture-free; and third, moisture- and ash-free. Analyses are by a commercial testing laboratory following ASTM standards.]

	Proximate Analysis				Ultimate Analysis					Heat of Combustion	
Sample Number	Moisture	Volatile Matter	Fixed Carbon	Ash	Hydrogen	Carbon	Nitrogen	Oxygen	Sulfur	Kcal/kg	Btu/lb
D192380	36.1	26.2	32.0	5.7	6.2	39.6	0.8	46.1	1.7	3,540	6,380
	---	41.0	50.1	8.9	3.4	62.0	1.3	21.9	2.7	5,540	9,980
	---	45.0	55.0	---	3.8	68.0	1.4	24.1	2.9	6,090	10,960
D194480	32.2	28.4	31.5	7.9	5.7	39.1	.4	45.3	1.6	3,430	6,180
	---	41.9	46.5	11.7	3.1	57.7	.6	24.6	2.4	5,060	9,110
	---	47.4	52.6	---	3.5	65.3	.7	27.8	2.7	5,730	10,320
D194484	48.1	23.4	14.6	13.9	6.6	20.6	.5	56.7	1.7	1,690	3,040
	---	45.1	28.1	26.8	2.4	39.7	1.0	26.9	3.3	3,250	5,860
	---	61.6	38.4	---	3.3	54.2	1.3	36.7	4.5	4,440	8,000
D178625	31.2	25.1	24.0	19.7	5.9	33.6	.8	38.6	1.4	3,030	5,450
	---	36.5	34.9	28.6	3.5	48.8	1.2	15.8	2.0	4,400	7,920
	---	51.1	48.9	---	5.0	68.4	1.6	22.1	2.9	6,170	11,100
D192381	34.7	23.8	20.2	21.3	5.7	29.4	.7	42.1	.7	2,530	4,550
	---	36.4	30.9	32.6	2.8	45.0	1.1	17.2	1.1	3,870	6,960
	---	54.1	45.9	---	4.2	66.8	1.6	25.6	1.6	5,740	10,330
D194481	25.6	26.5	1.8	46.1	4.2	15.4	.5	33.4	.4	1,160	2,080
	---	35.6	2.4	62.0	1.8	20.7	.7	14.3	.5	1,560	2,800
	---	93.6	6.4	---	4.8	54.4	1.8	37.6	1.4	4,090	7,360
D194482	21.3	16.4	5.9	56.4	3.6	12.2	.4	26.7	.8	1,010	1,820
	---	20.8	7.5	71.7	1.6	15.5	.5	9.9	1.0	1,290	2,320
	---	73.5	26.5	---	5.5	54.7	1.8	34.8	3.6	4,540	8,180
D194478	17.3	26.6	34.4	21.7	5.1	43.2	1.0	25.0	4.0	4,210	7,580
	---	32.2	41.6	26.2	3.8	52.2	1.2	11.6	4.8	5,090	9,170
	---	43.6	56.4	---	5.2	70.8	1.6	15.8	6.6	6,910	12,430
D194479	18.7	24.4	32.5	24.4	5.0	40.2	.9	26.7	2.7	3,890	7,010
	---	30.0	40.0	30.0	3.6	49.4	1.1	12.4	3.3	4,790	8,620
	---	42.9	57.1	---	5.1	70.7	1.6	17.7	4.7	6,840	12,320
D178626	20.5	31.0	28.8	19.7	5.2	38.7	1.1	29.6	5.7	3,670	6,610
	---	39.0	36.2	24.8	3.7	48.7	1.4	14.3	7.2	4,620	8,310
	---	51.8	48.2	---	4.9	64.7	1.8	19.0	9.5	6,140	11,050
D178627	35.2	29.2	20.9	14.7	5.7	30.6	.9	47.1	1.0	2,460	4,430
	---	45.1	32.3	22.7	2.8	47.2	1.4	24.4	1.5	3,800	6,840
	---	58.3	41.7	---	3.6	61.1	1.8	31.6	2.0	4,910	8,840

Table 5b. (cont'd.) Proximate and ultimate analyses, heat of combustion, forms of sulfur, free-swelling index, and ash-fusion temperature determinations for Nebraska coal samples. B means not determined.

Sample Number	Air-dried Loss	Forms of Sulfur			Free Swelling Index	Ash Fusion Temperature, °C		
		Sulfate	Pyritic	Organic		Initial Deformation	Softening	Fluid
D192380	27.5	0.12	0.11	1.48	B	1,080	1,110	1,140
	---	.19	.17	2.32				
	---	.21	.19	2.54				
D194480	15.6	.03	.11	1.43	B	1,095	1,110	1,125
	---	.04	.16	2.11				
	---	.05	.18	2.39				
D194484	37.1	.00	.17	1.56	B	1,090	1,105	1,120
	---	.00	.33	3.01				
	---	.00	.45	4.11				
D178625	25.6	.08	.03	1.26	0.	1,155	1,170	1,190
	---	.12	.04	1.83				
	---	.16	.06	2.57				
D192381	26.4	.01	.11	.59	B	1,055	1,080	1,110
	---	.02	.17	.90				
	---	.02	.25	1.34				
D194481	15.9	.00	.24	.19	B	1,070	1,095	1,115
	---	.00	.32	.26				
	---	.00	.85	.67				
D194482	9.8	.11	.35	.33	B	1,170	1,275	1,325
	---	.14	.44	.42				
	---	.49	1.57	1.48				
D194478	2.8	1.17	.51	2.35	B	1,145	1,170	1,325
	---	1.41	.62	2.84				
	---	1.92	.84	3.85				
D194479	2.4	.79	.21	1.74	B	1,200	1,350	1,440
	---	.97	.26	2.14				
	---	1.39	.37	3.06				
D178626	16.9	3.05	1.59	1.09	0.	975	1,000	1,020
	---	3.84	2.00	1.37				
	---	5.10	2.66	1.82				
D178627	27.2	.39	.04	.59	0.	1,165	1,180	1,200
	---	.60	.06	.91				
	---	.78	.08	1.18				

Table 5b. (cont'd.) Proximate and ultimate analyses, heat of combustion, forms of sulfur, free-swelling index, and ash-fusion temperature determinations for Nebraska coal samples.

Sample Number	Proximate Analysis				Ultimate Analysis					Heat of Combustion	
	Moisture	Volatile Matter	Fixed Carbon	Ash	Hydrogen	Carbon	Nitrogen	Oxygen	Sulfur	Kcal/kg	Btu/lb
D194483	35.1	27.4	19.3	18.2	5.5	27.6	0.8	46.3	1.7	2,260	4,070
	---	42.2	29.7	28.0	2.5	42.5	1.2	23.3	2.6	3,480	6,270
	---	58.7	41.3	---	3.4	59.1	1.7	32.3	3.6	4,840	8,710

Sample Number	Air-dried Loss	Forms of Sulfur			Free Swelling Index	Ash Fusion Temperature, °C		
		Sulfate	Pyritic	Organic		Initial Deformation	Softening	Fluid
D194483	23.9	1.16	0.11	0.39	0.0	1,065	1,080	1,110
	---	1.79	.17	.60				
	---	2.48	.24	.84				

Table 5c. Major- and minor- oxides concentrations in the laboratory ash of Nebraska coal samples.

[Values in percent. Coal ashed at 525 °C. L means less than value shown.]

Sample Number	Ash (percent)	SiO_2 (percent)	Al_2O_3 (percent)	CaO (percent)	MgO (percent)	Na_2O (percent)	K_2O (percent)	Fe_2O_3 (percent)	TiO_2 (percent)	P_2O_5 (percent)	SO_3 (percent)	Sample Number
D192380	8.9	23	10	1.9	0.33	0.24	1.3	41	0.41	1.6	6.2	D192380
D194480	10.9	21	6.7	1.6	.30	.21	.70	56	.45	1.6	4.5	D194480
D194484	22.9	26	7.7	.97	.64	.29	1.4	44	.47	3.1	11	D194484
D178625	28.5	37	17	6.8	2.2	.28	2.8	9.8	.63	1.0L	12	D178625
D192381	30.4	31	11	13	2.2	4.6	1.4	19	.78	1.2	8.8	D192381
D194481	61.5	34	14	5.3	1.2	.24	1.7	33	.55	1.0L	2.5	D194481
D194482	73.3	50	21	2.0	1.5	.32	3.2	12	.86	1.0L	3.9	D194482
D194478	26.0	44	18	2.7	1.9	.53	2.9	13	.87	1.0L	7.4	D194478
D194479	33.0	50	23	1.1	1.9	.45	3.4	9.2	.99	1.0L	4.2	D194479
D178626	22.9	27	8.0	9.5	.51	.61	1.6	21	.39	1.0L	15	D178626
D178627	21.3	17	17	17	2.1	.28	1.2	12	.45	1.0L	23	D178627
D194483	27.0	34	12	6.9	.60	.78	1.7	25	.64	1.0L	15	D194483

Table 5d. Major-, minor-, and trace-element concentrations of Nebraska coal samples.

[Values in percent or parts-per-million. Elements not determined on whole coal have been calculated from analyses of ash. S means analysis by six-step emission spectrography; L, less than the value shown; B, not determined; N not detected.]

Sample Number	Si (percent)	Al (percent)	Ca (percent)	Mg (percent)	Na (percent)	K (percent)	Fe (percent)	Ti (percent)	As (ppm)	B-S (ppm)	Sample Number
D192380	0.96	0.47	0.12	0.018	0.016	0.096	2.6	0.022	42	13	D192380
D194480	1.1	.39	.12	.020	.017	.064	4.3	.029	38	7.6	D194480
D194484	2.8	.93	.16	.088	.049	.27	7.0	.064	4.9	11	D194484
D178625	4.9	2.6	1.4	.38	.059	.66	2.0	.11	12	43	D178625
D192381	4.4	1.8	2.8	.40	1.0	.35	4.0	.14	180	21	D192381
D194481	9.8	4.6	2.3	.44	.11	.87	14	.20	43	43	D194481
D194482	17	8.1	1.0	.68	.17	2.0	6.1	.38	26	73	D194482
D194478	5.3	2.5	.50	.30	.10	.63	2.4	.14	6.1	260	D194478
D194479	7.7	4.0	.26	.37	.11	.93	2.1	.20	7.0	230	D194479
D178626	2.9	.97	1.6	.070	.10	.31	3.4	.054	32	69	D178626
D178627	1.7	1.9	2.6	.27	.044	.21	1.8	.057	11	11L	D178627
D194483	4.3	1.7	1.3	.098	.16	.38	4.7	.10	27	27	D194483

Sample Number	Ba-S (ppm)	Be-S (ppm)	Cd (ppm)	Co (ppm)	Cr (ppm)	Cu (ppm)	F (ppm)	Ga-S (ppm)	Ge-S (ppm)	Hg (ppm)	Sample Number
D192380	27	0.62	1.7	0.23	7.3	17	30	4.5	27	0.17	D192380
D194480	33	.76	2.6	.25	7.7	19	40	5.5	16	.080	D194480
D194484	230	N	.23L	6.8	28	77	80	6.9	23	.070	D194484
D178625	140	2.0	.43	2.9L	43	68	200	14	43	.080	D178625
D192381	910	.91	4.0	29	25	58	210	9.1	61	.10	D192381
D194481	180	4.3	4.9	14	64	130	450	31	43	.11	D194481
D194482	370	5.1	.73L	9.8	96	130	560	37	37	.080	D194482
D194478	130	3.9	90	4.3	44	47	370	18	52	.11	D194478
D194479	99	3.3	45	6.0	47	63	420	23	33	.10	D194479
D178626	69	3.4	.23L	2.3	16	26	180	6.9	46	.11	D178626
D178627	32	1.5	1.5	11	15	31	75	6.4	32	.14	D178627
D194483	81	N	.27L	5.0	39	85	80	8.1	40	.11	D194483

Table 5d. (cont'd.) Major-, minor-, and trace-element concentrations of Nebraska coal samples.

Sample Number	Li (ppm)	Mn (ppm)	Mo-S (ppm)	Nb-S (ppm)	Nd-S (ppm)	Ni-S (ppm)	P (ppm)	Pb (ppm)	Sb (ppm)	Sc (ppm)	Sample Number
D192380	1.6	3.8	18	1.8L	B	1.3	620	590	8.1	1.3	D192380
D194480	1.5	3.5	11	N	B	1.6	760	170	5.6	1.6	D194480
D194484	3.2	22	11	N	34L	11	3,100	44	N	6.9	D194484
D178625	23	20	8.6	5.7	B	8.6	1,200L	140	1.9	5.7	D178625
D192381	11	740	15	N	B	21	1,600	120	14	3.0	D192381
D194481	57	250	31	N	92L	61	2,700L	250	3.3	18	D194481
D194482	67	100	22	N	N	51	3,200L	180	4.5	22	D194482
D194478	23	81	18	5.2	N	39	1,100L	91	1.6	7.8	D194478
D194479	33	63	17	6.6	N	33	1,400L	89	1.4	9.9	D194479
D178626	3.9	72	16	4.6	B	16	1,000L	160	2.0	2.3	D178626
D178627	3.8	8.5	11	4.3L	32	64	930L	200	3.7	3.2	D178627
D194483	8.4	18	14	N	40L	40	1,200L	180	4.8	14	D194483

Sample Number	Se (ppm)	Sr-S (ppm)	Th (ppm)	U (ppm)	V-S (ppm)	Y-S (ppm)	Yb (ppm)	Zn (ppm)	Zr-S (ppm)	Sample Number
D192380	N	18	0.81	8.5	4.5	1.8	B	160	6.2	D192380
D194480	2.0	16	1.3	11	7.6	3.3	B	220	7.6	D194480
D194484	4.1	230	3.5	10	16	11	B	27	16	D194484
D178625	2.9	43	N	17	85	8.6	B	120	29	D178625
D192381	36	150	2.8	22	21	6.1	B	760	30	D192381
D194481	6.2	120	11	12	120	43	B	1,500	43	D194481
D194482	2.4	220	13	15	220	15	B	73	110	D194482
D194478	3.8	78	4.7	13	78	13	B	8,500	39	D194478
D194479	3.5	99	8.3	12	160	9.9	B	4,600	49	D194479
D178626	1.6	23	5.6	3.6	34	4.6	B	24	16	D178626
D178627	1.6	21	13	12	21	32	3.2	35	15	D178627
D194483	1.9	130	5.8	13	19	19	B	26	27	D194483

The 85 samples in USCHEM from Oklahoma are from the Krebs and Cabaniss Groups (Figure 12). Data for Krebs Group coals have been published by Hildebrand (1981). Data have also been published in Swanson and others (1976). Therefore, **there are no data tables for Oklahoma coals (Tables 6a through 6d) included in this report.** Figure 13 shows the locations of the collected samples.

SERIES	GROUP	BED
Des Moines	Cabaniss	Iron Post Croweburg Mineral Weir-Pittsburg
	Krebs	Secor Rowe McAlester (Stigler) Hartshorne

Figure 12. Stratigraphic column for coal-bearing units in Oklahoma that are represented in USCHEM.

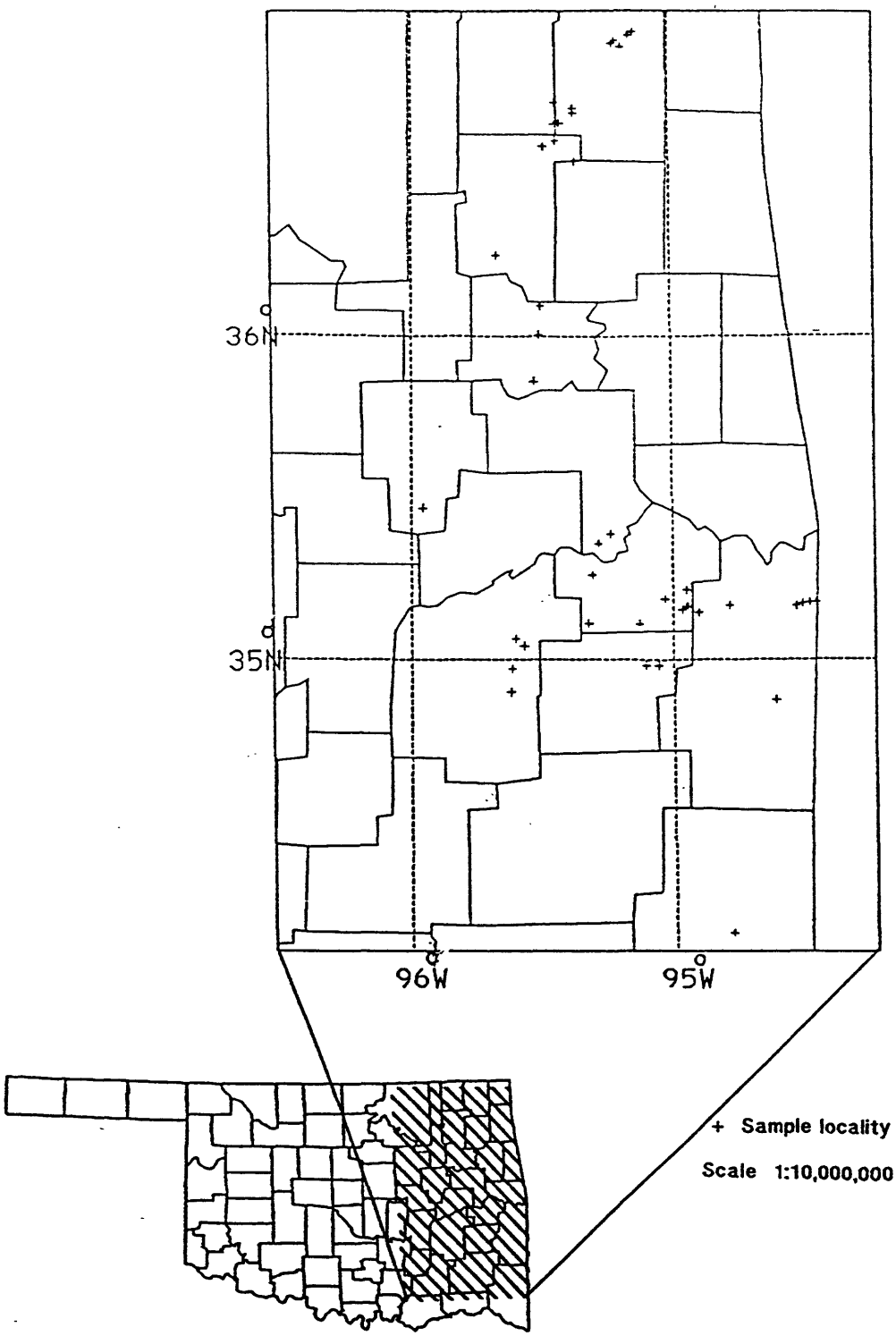

Figure 13. Collecting localities for USCHEM coal samples in Oklahoma. County boundaries are indicated.

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