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# Quality Characteristics of the Springfield Coal in Western Kentucky

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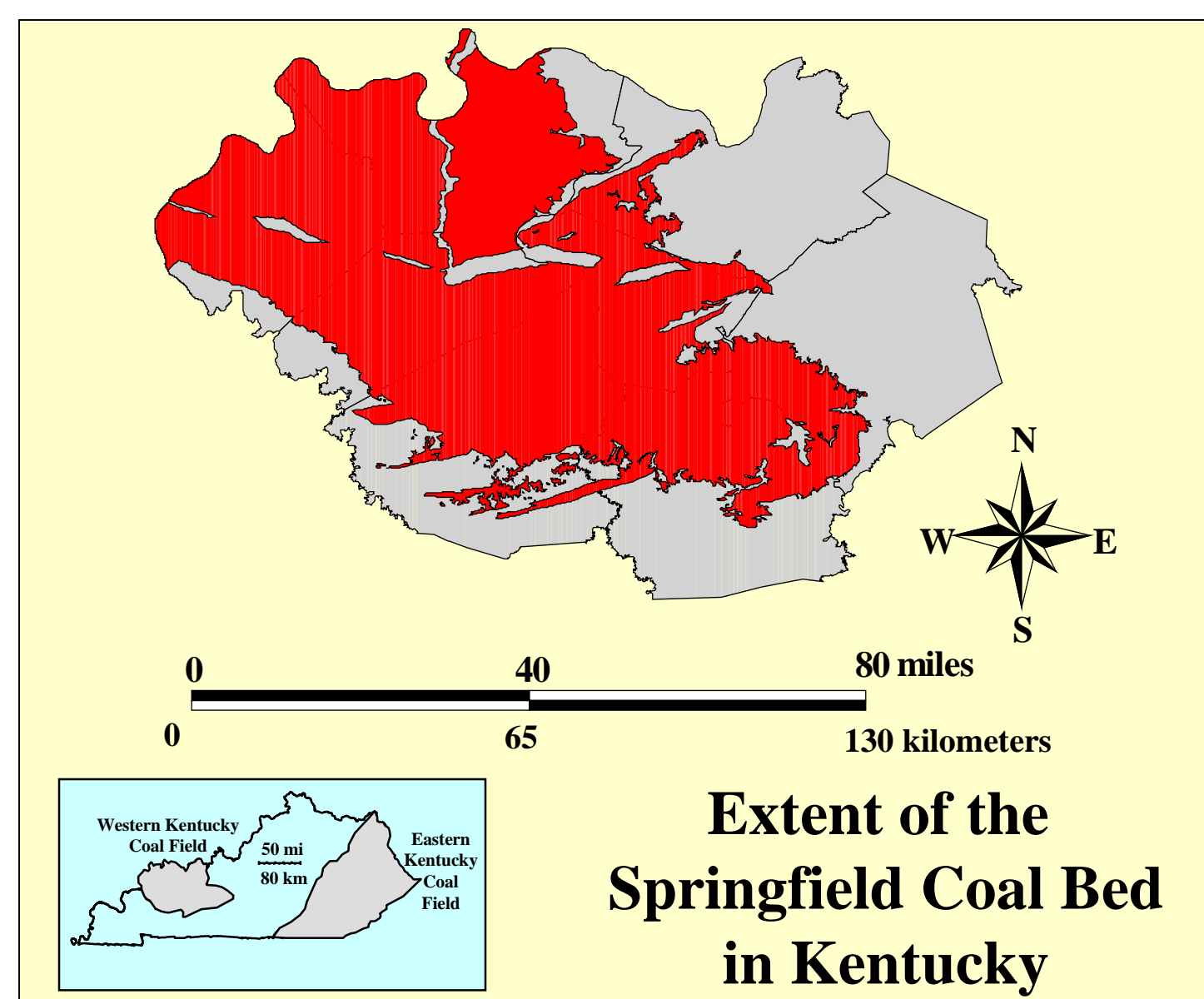
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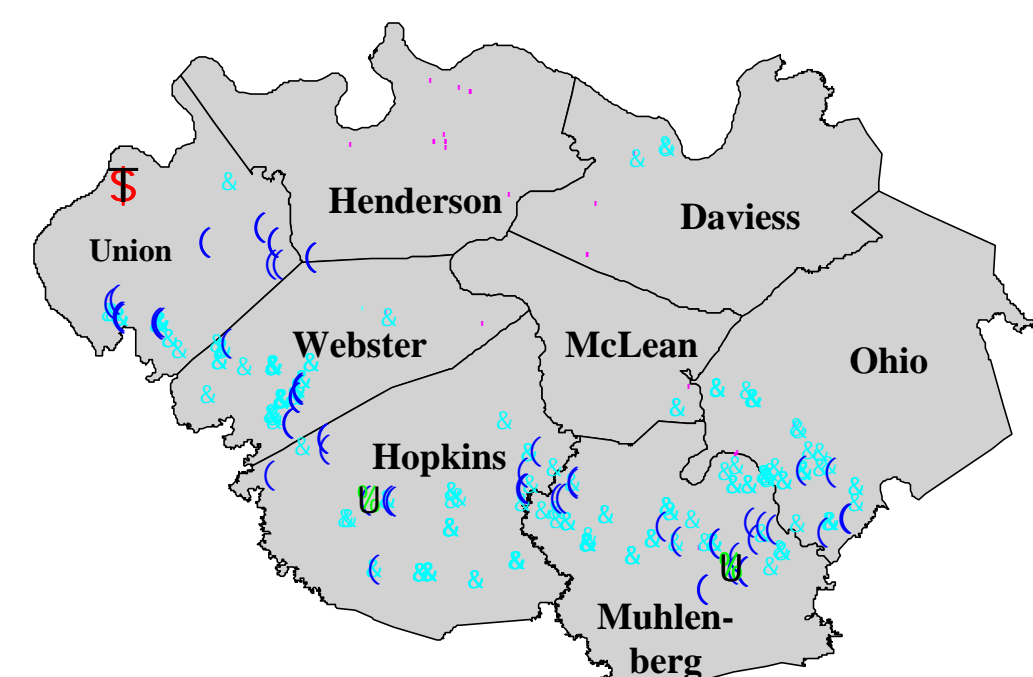


# Quality Characteristics of the Springfield Coal in Western Kentucky

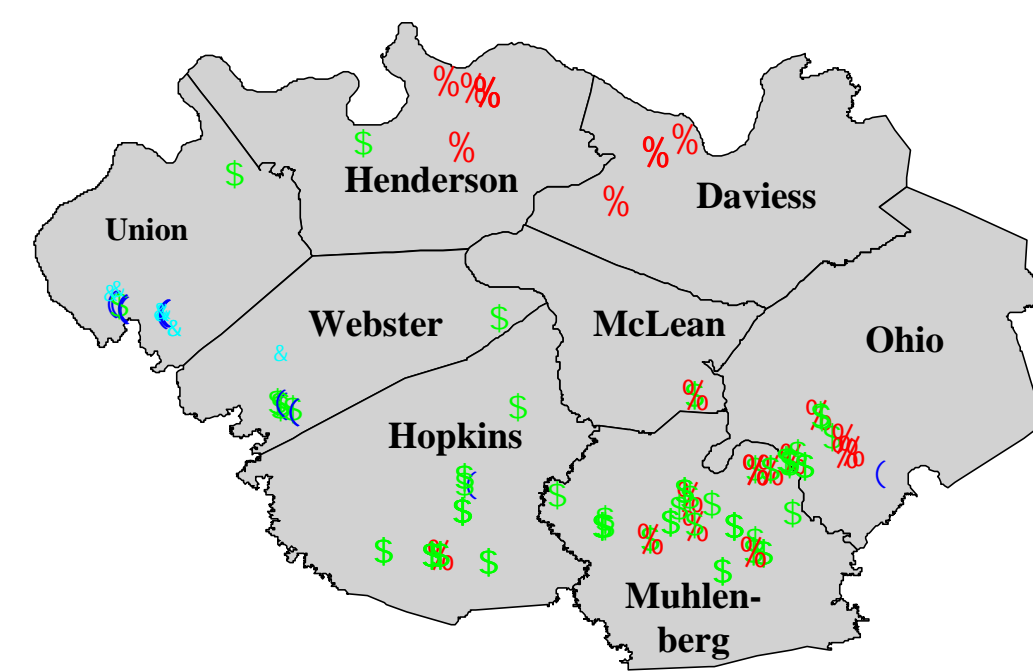
Cortland F. Eble



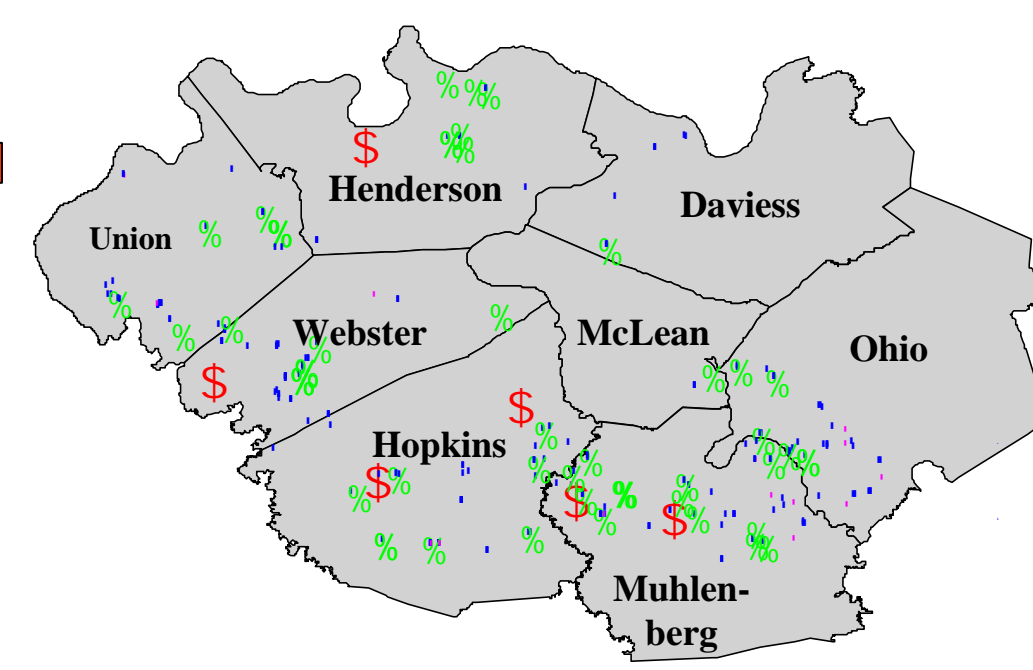
**Extent of the Springfield Coal Bed in Kentucky**



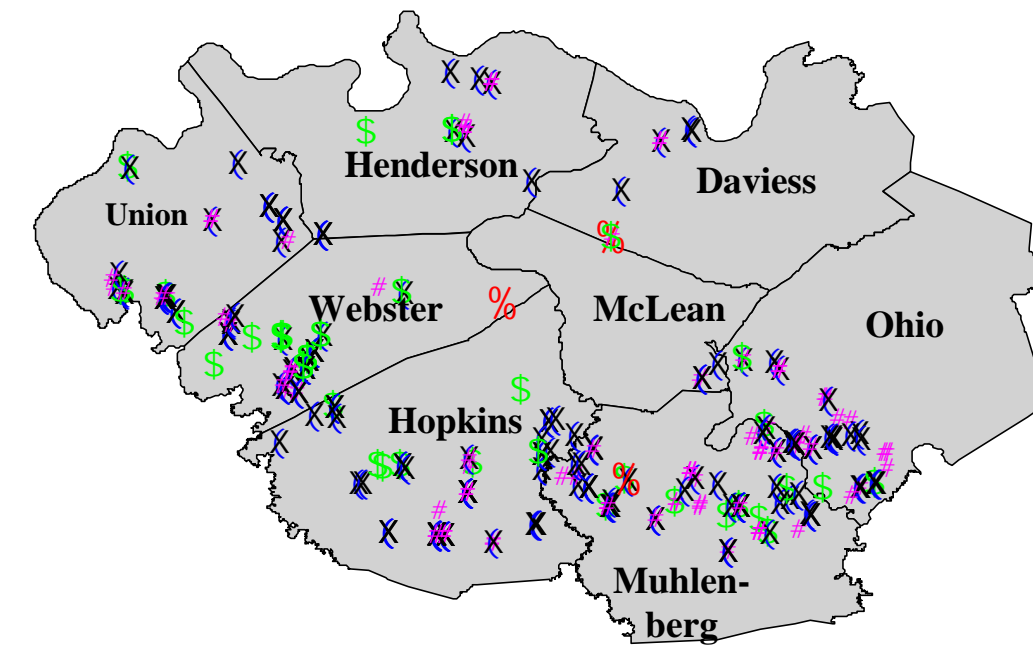
**Total Coal Thickness (inches)**  
30 to 48  
48 to 60  
60 to 72  
72 to 84  
84 to 150



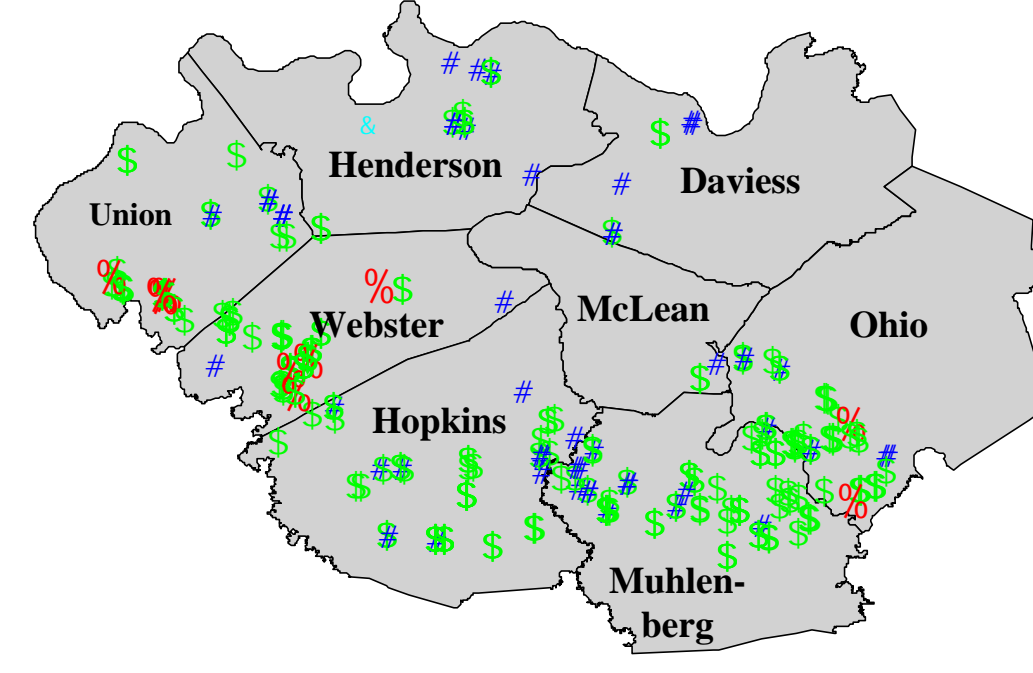
**Total Moisture Content**  
1 to 3  
3 to 5  
5 to 10  
10 to 15



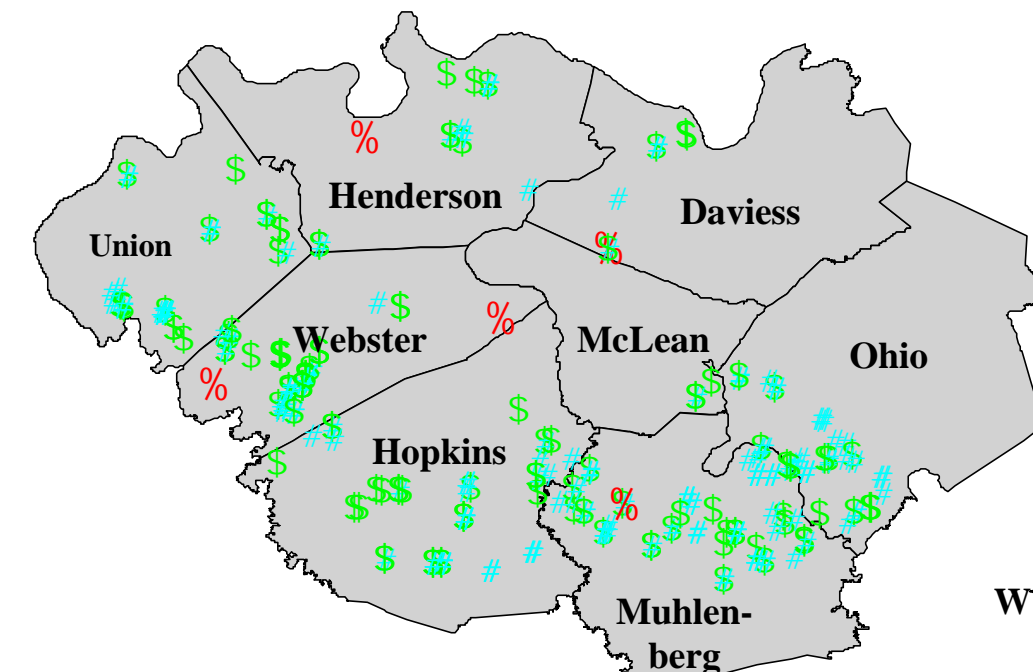
**Ash Yield (dry basis)**  
5 to 8  
8 to 12  
12 to 15  
15 to 20



**Total Sulfur Content (dry basis)**  
1 to 3  
3 to 4  
4 to 6  
6 to 8



**Calorific Value, Btu/lb (dry basis)**  
10,500 to 11,500  
11,500 to 12,500  
12,500 to 13,500  
13,500 to 14,500



**Compliance Sulfur (dry basis)**  
1.5 to 3  
3 to 6  
6 to 10  
10 to 14

Western Europe Stage	Series	Group	Formation
Westphalian D	Middle Pennsylvanian Series	McLeansboro Gp.	Shelburn Fm
			Carbondale Formation
			Tradewater Formation
			Caseyville Formation
			Raccoon Creek Group
Duckmantian	Middle Pennsylvanian Series	Raccoon Creek Group	Tradewater Formation
Bolsovan			
Langsettian	Middle Pennsylvanian Series	Raccoon Creek Group	Caseyville Formation

- Coiltown (W. Ky. 14)
- Baker (W. Ky. No. 13)
- Herrin (W. Ky. No. 11)
- Springfield (W. Ky. No. 9)
- Colchester (W. Ky. No. 8)
- Dekoven (W. Ky. No. 7)
- Davis (W. Ky. No. 6)
- Bancroft (W. Ky. No. 5)
- Mannington (W. Ky. No. 4)
- Elm Lick zone
- Dunbar
- Ice House (W. Ky. No. 3)
- Amos/Foster zone
- Hawesville
- Bell (W. Ky. No. 1b)
- Battery Rock, Main Nolin

	Total Coal	Total Parting	Total Moisture	Ash Yield	Volatile Matter	Fixed Carbon	Total Sulfur	Calorific Value	Compliance Sulfur
<b>Webster</b>	Average 56.8	0.1	4.8	11.1	38.1	50.8	4.3	13,167	6.5
	Maximum 72.0	2.0	6.1	16.2	40.8	56.3	8.5	14,132	13.9
	Minimum 33.0	0.0	2.5	6.3	34.7	46.4	2.9	12,095	4.2
	Count 51	51	10	51	51	51	51	51	51
<b>Union</b>	Average 66.6	0.1	3.7	11.0	38.5	50.5	3.9	13,006	6.0
	Maximum 143.0	1.8	9.2	14.7	43.0	53.7	5.4	13,659	8.5
	Minimum 50.5	0.0	1.8	7.2	35.9	48.1	2.8	11,748	4.1
	Count 37	37	22	37	37	37	37	37	37
<b>Ohio</b>	Average 55.9	0.0	9.3	10.4	41.1	48.5	3.6	12,877	5.6
	Maximum 70.0	0.6	10.6	13.8	45.0	52.6	5.6	13,575	9.0
	Minimum 48.0	0.0	4.6	5.6	39.0	44.3	2.3	12,403	3.4
	Count 40	40	18	40	40	40	40	40	40
<b>Muhlenberg</b>	Average 58.6	0.0	8.8	11.1	39.5	49.4	3.7	12,794	5.9
	Maximum 76.0	1.0	11.2	17.9	42.2	55.2	6.8	13,451	10.9
	Minimum 33.1	0.0	5.6	6.8	34.3	43.6	2.4	11,797	3.8
	Count 75	75	46	75	75	75	75	75	75
<b>Hopkins</b>	Average 58.5	0.1	8.3	10.9	39.8	49.3	3.9	12,801	6.0
	Maximum 77.0	1.0	10.1	16.1	42.5	53.8	5.9	13,343	9.7
	Minimum 48.5	0.0	3.7	7.9	36.3	44.3	2.4	12,192	3.6
	Count 60	60	33	60	60	60	60	60	60
<b>Henderson</b>	Average 48.7	0.1	10.5	12.3	39.7	48.0	3.9	12,416	6.3
	Maximum 66.2	0.5	12.2	18.8	41.6	51.7	5.8	12,845	10.8
	Minimum 42.5	0.0	7.6	10.3	37.5	42.1	2.5	10,709	4.0
	Count 18	18	8	18	18	18	18	18	18
<b>Other</b>	Average 50.4	0.2	11.6	10.6	39.6	49.8	3.6	12,695	5.7
	Maximum 76.2	2.9	14.9	14.2	41.6	57.8	6.7	13,675	11.3
	Minimum 40.0	0.0	9.0	5.8	36.4	45.3	1.3	11,828	1.9
	Count 15	15	8	15	15	15	15	15	15

	As	Be	Cd	Ct	Co	Cr	Hg	Mn	Ni	Pb
<b>Webster</b>	Average 20.00	1.10	0.55	1,900.00	3.06	19.06	0.06	30.98	13.69	8.50
	Maximum 20.00	1.10	0.55	1,900.00	4.17	38.55	0.06	78.81	82.95	9.50
	Minimum 20.00	1.10	0.55	1,900.00	1.67	9.89	0.06	3.79	6.69	9.50
	Count 1	1	1	1	42	42	1	41	42	1
<b>Ohio</b>	Average 2.60	2.61	0.23	220.00	3.69	12.53	0.02	48.48	11.68	2.04
	Maximum 3.18	3.80	0.40	220.00	4.96	23.54	0.03	135.10	33.86	2.90
	Minimum 1.95	1.49	0.09	220.00	2.35	4.89	0.01	0.63	4.55	1.12
	Count 4	4	4	1	21	21	4	20	21	4
<b>Muhlenberg</b>	Average 5.05	2.29	0.17	ND	3.42	19.93	0.02	34.30	10.25	2.90
	Maximum 8.28	5.10	0.65	ND	5.64	93.59	0.03	70.71	27.25	6.06
	Minimum 1.95	1.06	0.04	ND	1.59	7.10	0.01	8.01	2.34	1.68
	Count 8	8	8	ND	27	27	8	25	27	8
<b>Hopkins</b>	Average 7.97	1.31	0.35	1,900.00	3.50	16.34	0.02	55.75	10.27	8.00
	Maximum 12.00	1.67	1.05	1,900.00	4.94	44.29	0.03	190.00	23.60	11.00
	Minimum 5.06	0.48	0.05	1,900.00	1.74	7.66	0.01	15.16	3.02	5.57
	Count 7	8	7	1	27	28	7	28	28	7
<b>Other</b>	Average 11.47	1.80	0.49	183.33	3.81	16.70	0.06	57.13	12.12	7.87
	Maximum 21.00	2.10	1.10	350.00	5.43	35.05	0.07	180.00	44.43	11.00
	Minimum 6.50	1.60	0.08	100.00	2.20	4.46	0.06	1.42	4.33	3.90
	Count 3	3	3	3	32	32	3	30	32	3

	P	Sb	Se	Th	U
<b>Webster</b>	Average 180.00	2.00	6.30	1.40	7.00
	Maximum 180.00	2.00	6.30	1.40	7.00
	Minimum 180.00	2.00	6.30	1.40	7.00
	Count 1	1	1	1	1
<b>Ohio</b>	Average 44.00	0.43	1.70	1.32	1.55
	Maximum 44.00	0.60	1.97	1.52	1.80
	Minimum 44.00	0.30	1.48	1.14	1.35
	Count 1	4	4	4	4
<b>Muhlenberg</b>	Average ND	0.80	2.19	1.54	2.41
	Maximum ND	1.72	3.93	2.63	9.93
	Minimum ND	0.19	1.34	0.93	0.56
	Count ND	8	8	8	8
<b>Hopkins</b>	Average 66.00	1.82	2.74	1.21	3.80
	Maximum 66.00	2.61	3.60	1.42	6.99
	Minimum 66.00	1.34	2.11	1.08	1.74
	Count 1	7	7	7	7
<b>Other</b>	Average 96.00	1.43	2.90	1.53	3.45
	Maximum 200.00	2.40	4.50	1.70	6.50
	Minimum 44.00	0.28	1.10	1.20	0.64
	Count 3	3	3	3	3

Thickness and quality data from the Kentucky Coal Resources Information System (KCRIS) for the Springfield coal bed are summarized in this chart. Parameter averages and range of values are presented in the two tables, and average values are displayed graphically by county.

The Springfield (Western Kentucky No. 9) coal bed occurs in the Western Kentucky Coal Field and is one of the most heavily mined coals in Kentucky. The Springfield coal occurs near the middle of the Carbondale Formation, is one of the most laterally continuous coal beds in the Eastern Interior (Illinois) Basin, and has been a leading producer in Kentucky for several years. For example, in 1997 it accounted for nearly one-fourth of Kentucky's total coal production.

In western Kentucky, the Springfield is remarkably uniform, averaging 4.8 feet in thickness, 11.0 percent ash yield, 3.9 percent total sulfur, and 12,866 Btu/lb. Unfortunately, its high sulfur content has limited its use as a steam coal to electric utilities equipped with sulfur dioxide reduction technology, such as flue-gas desulfurization (often referred to as a "scrubber") or fluidized-bed combustion.

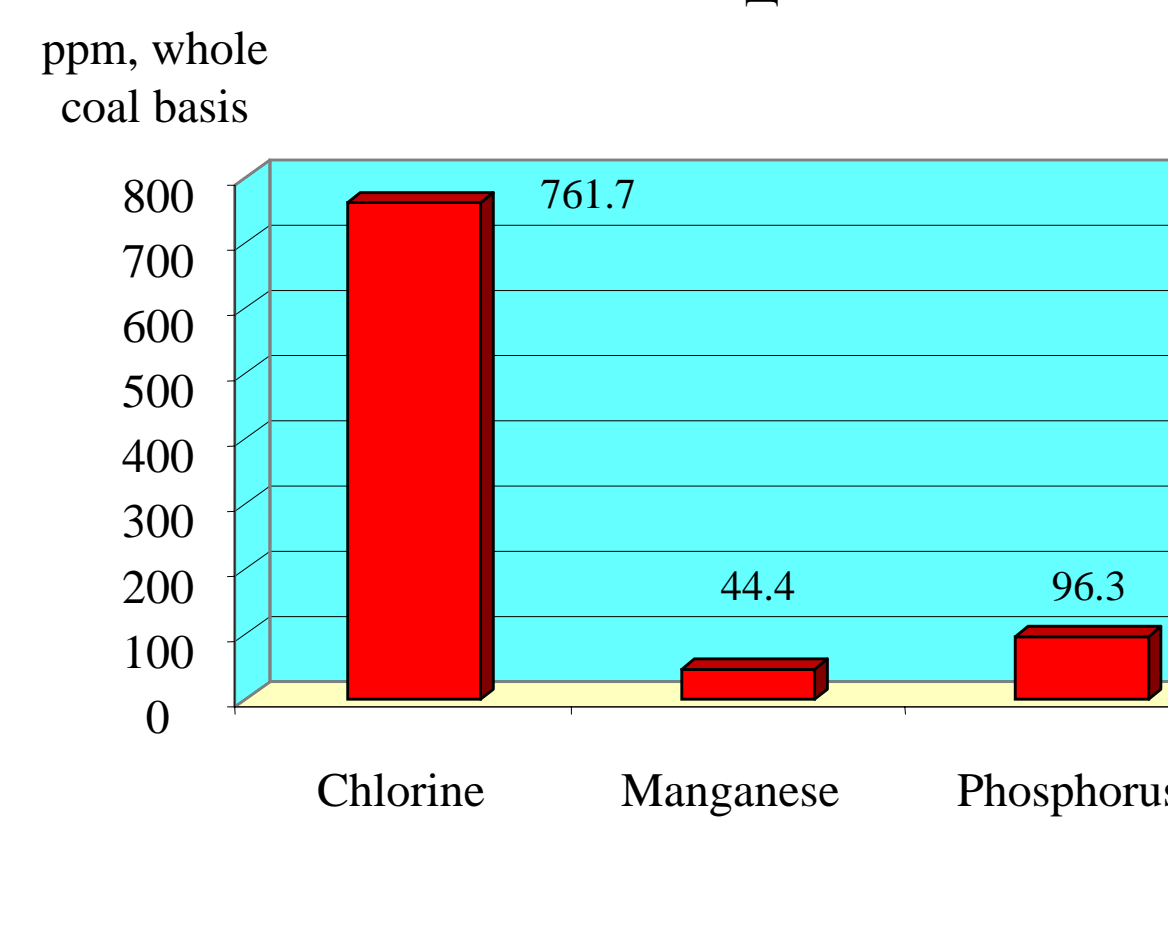
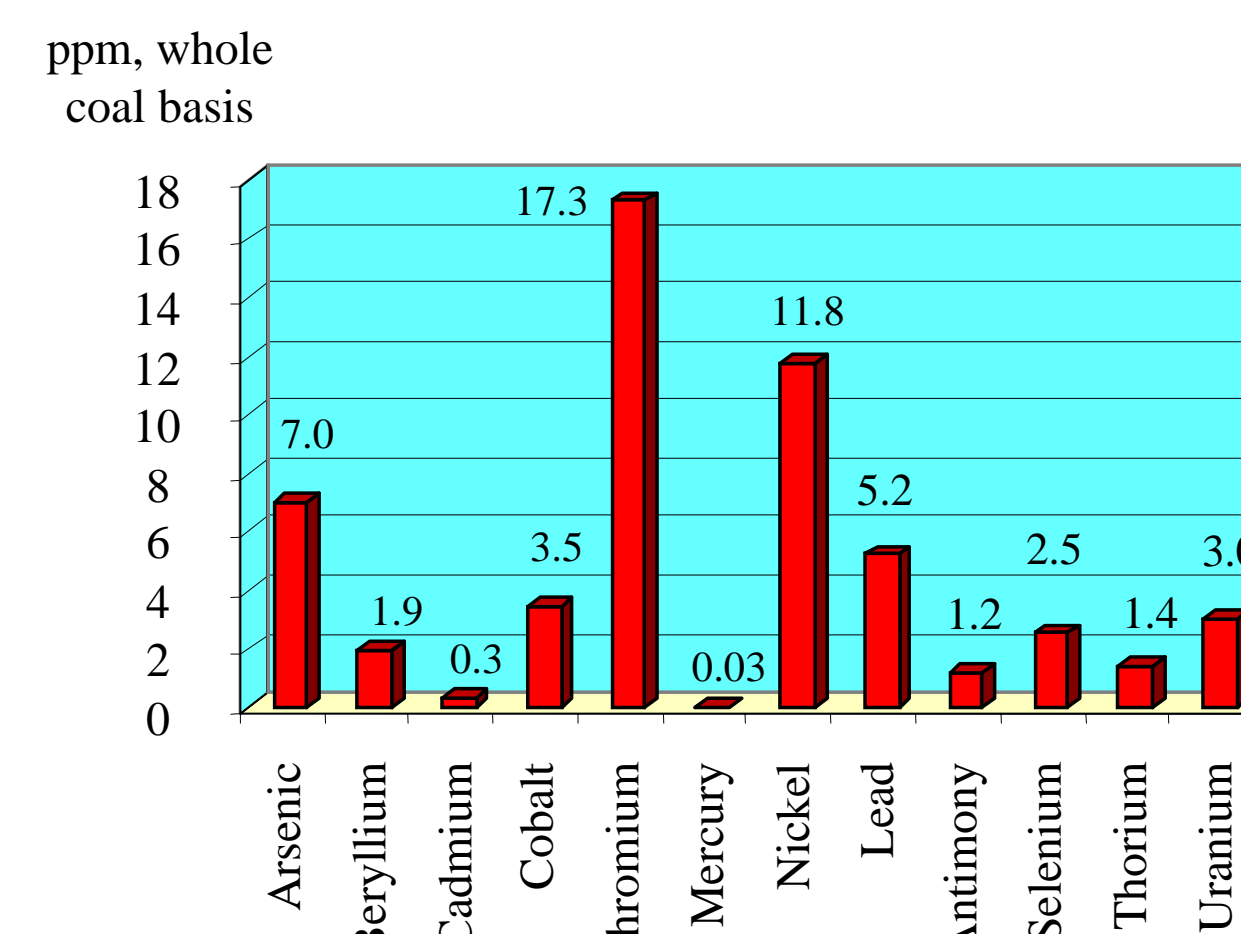
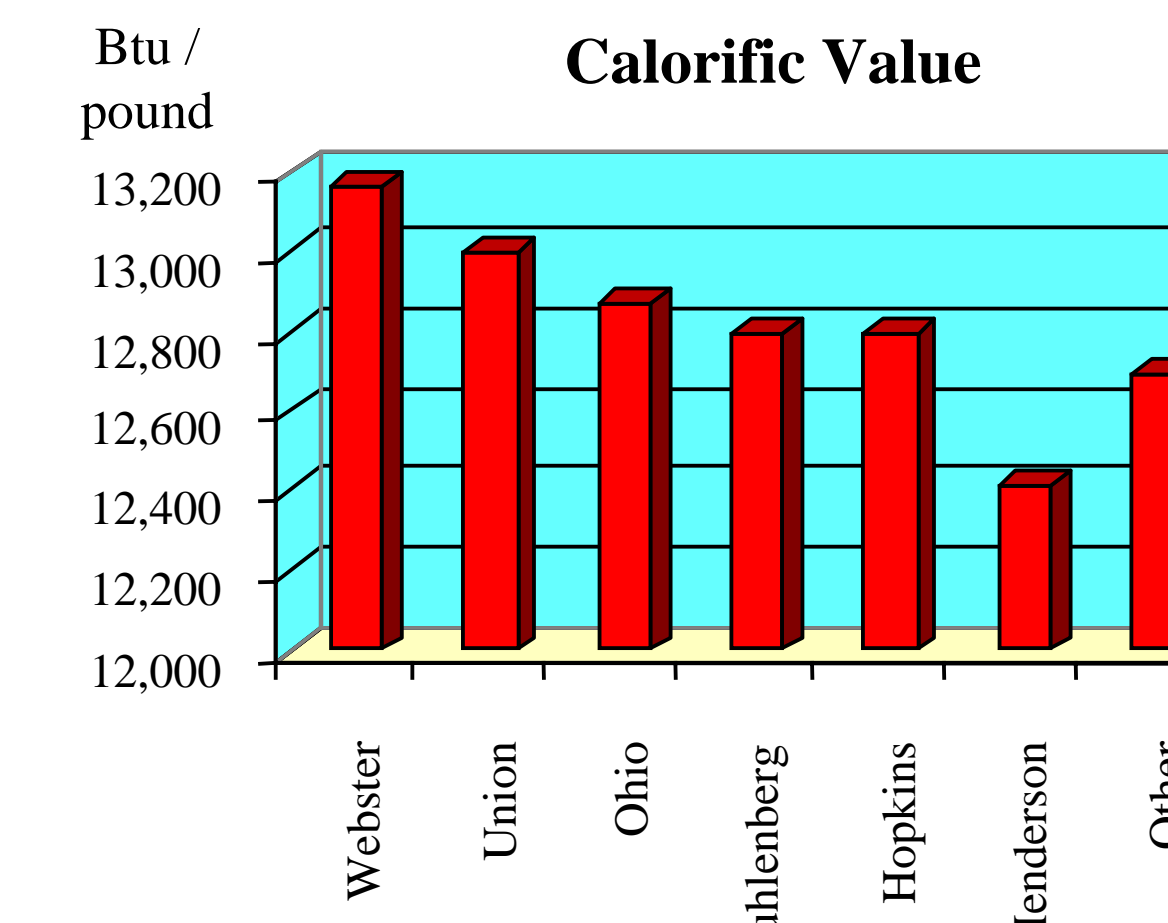
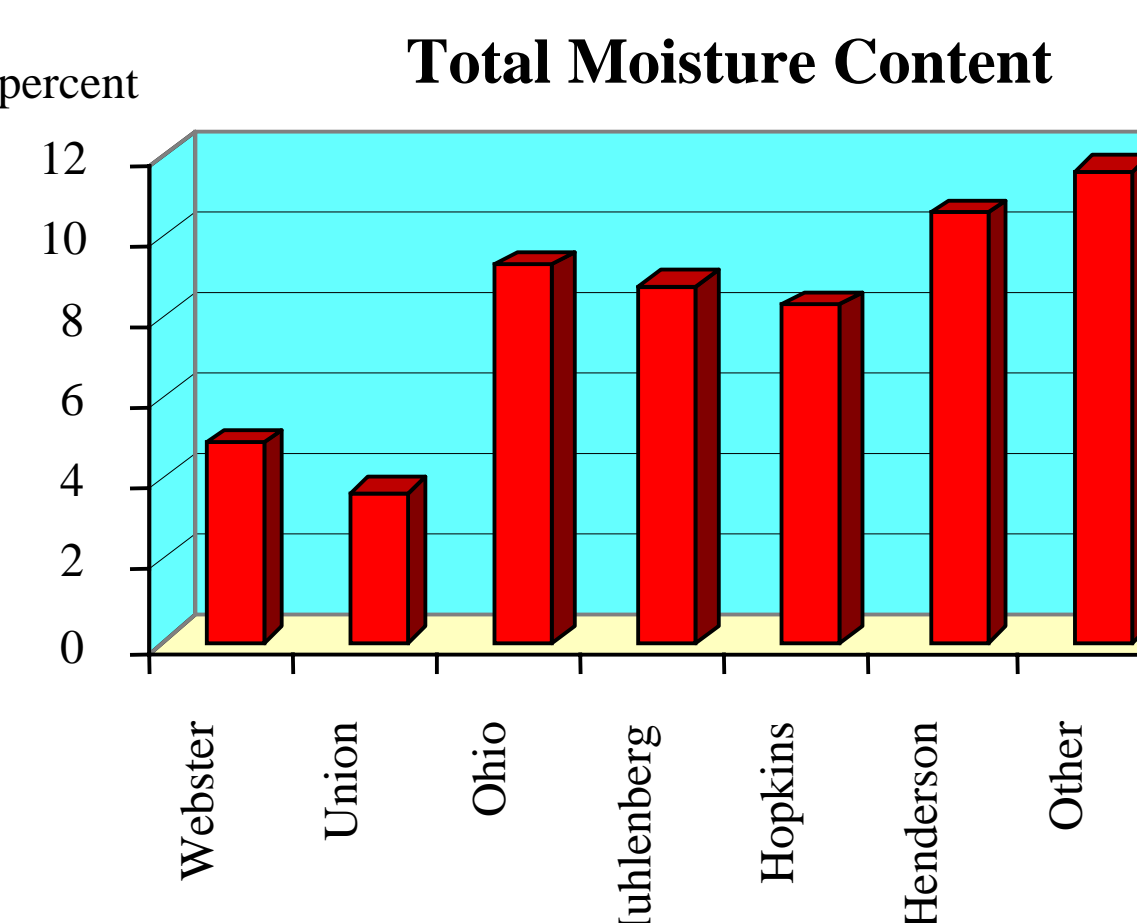
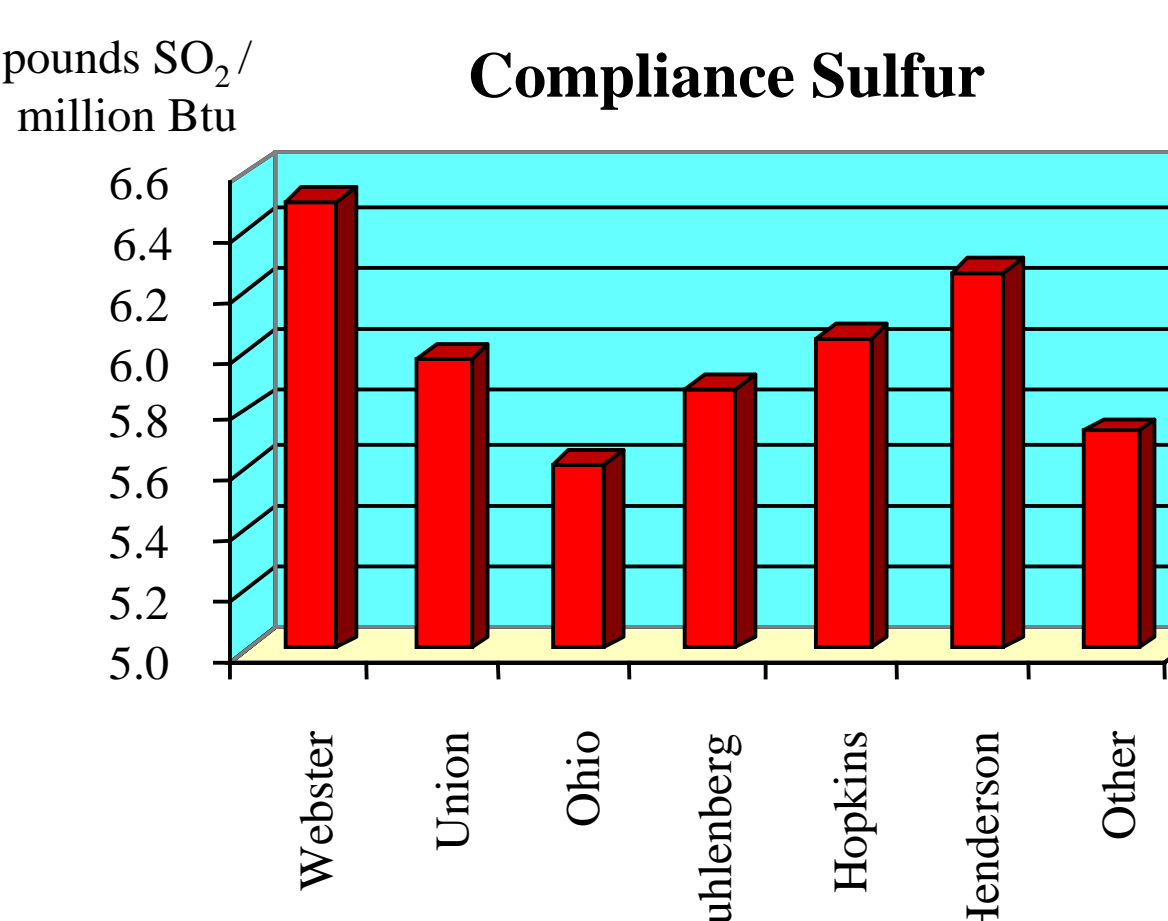
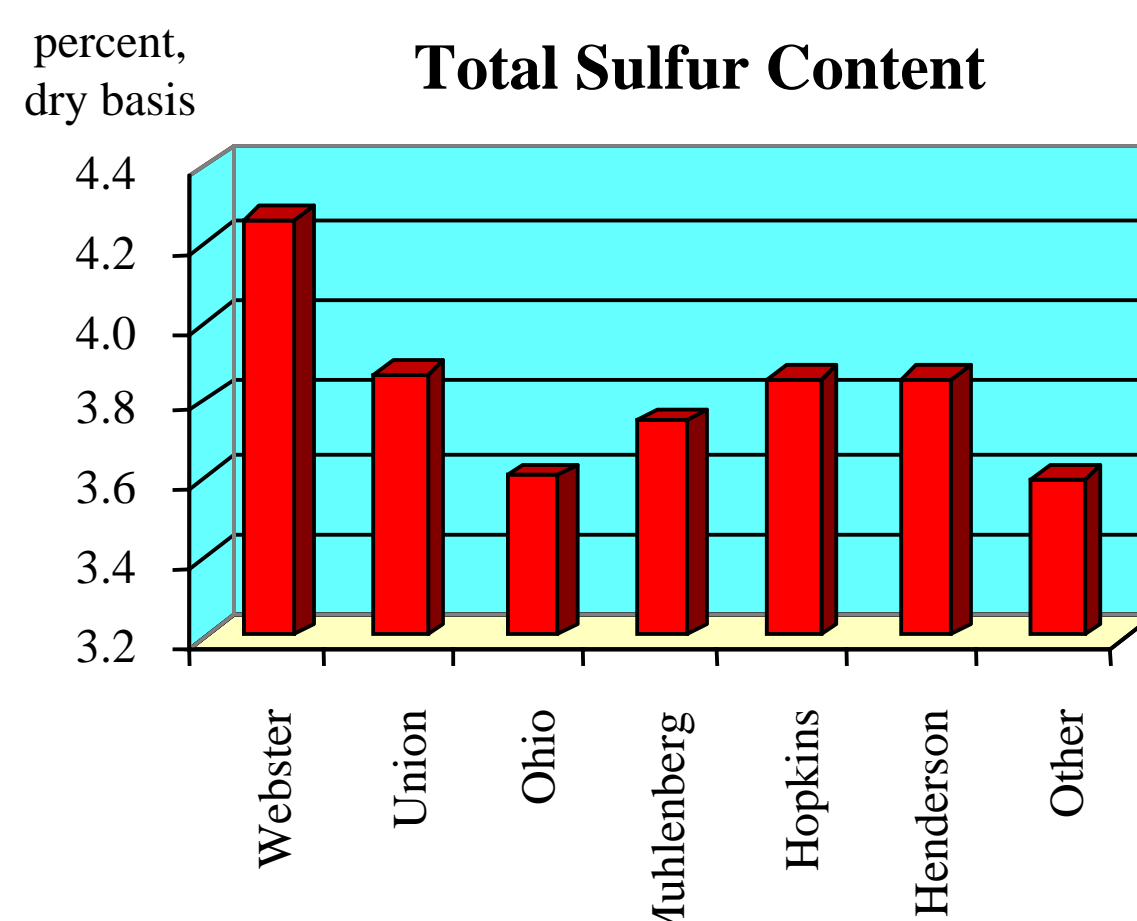
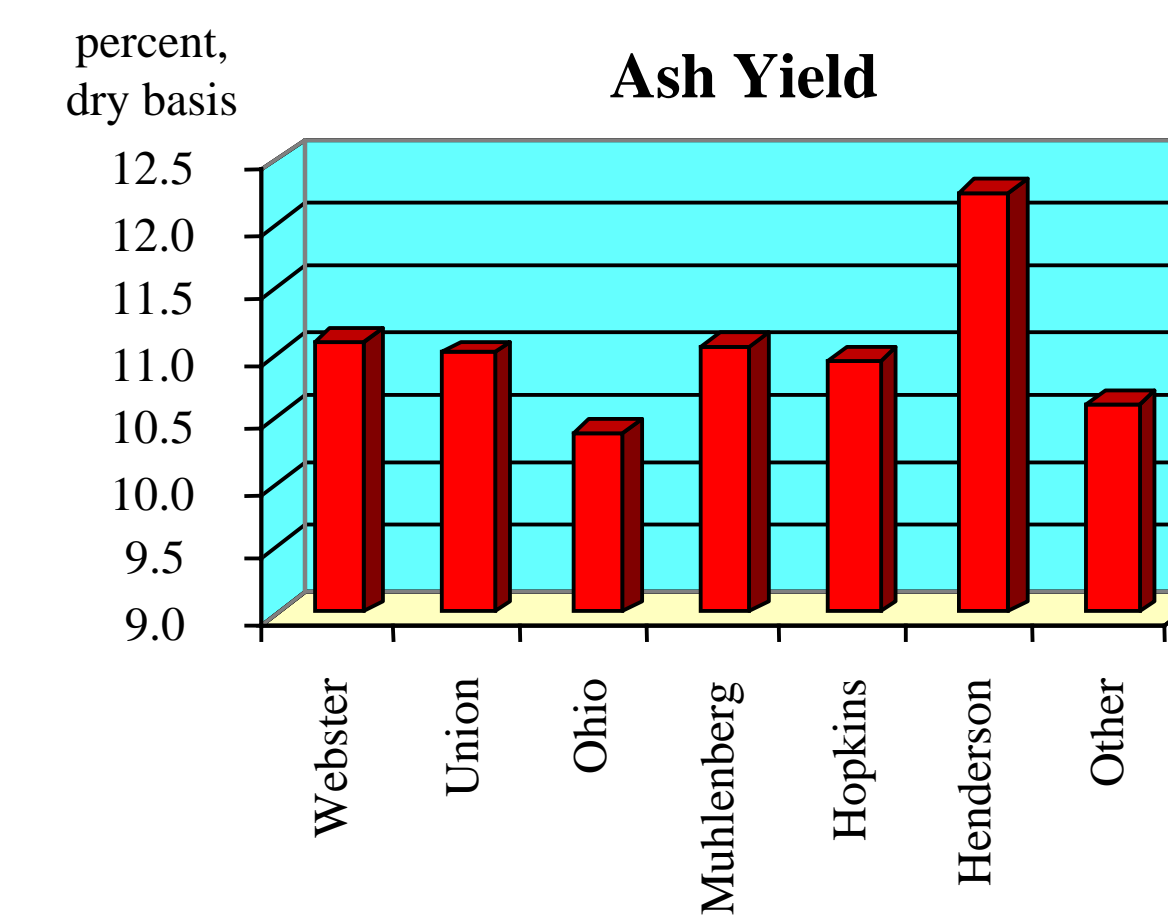
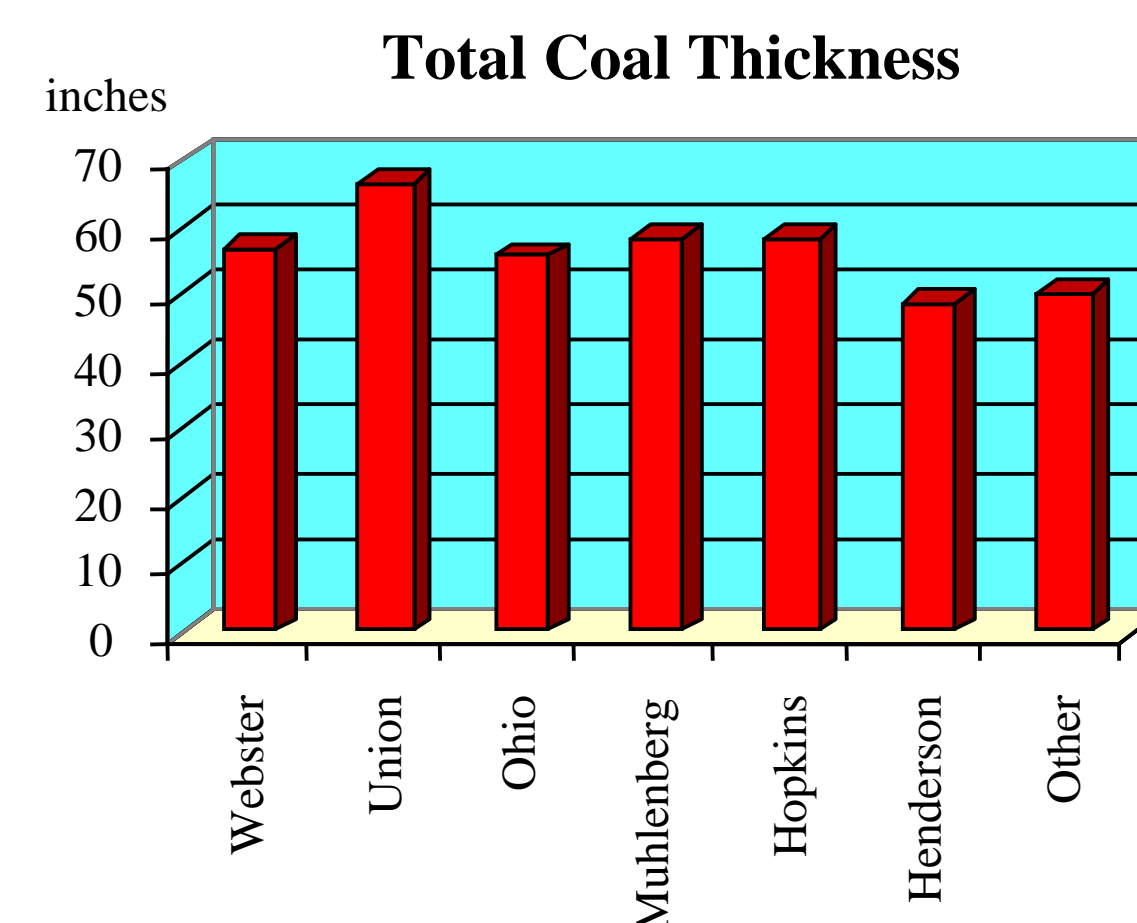
The Environmental Protection Agency is interested in the amount of mercury and chlorine in coal. Although elemental analyses are limited, KCRIS data indicate that the mercury content of the Springfield coal varies between 0.01 and 0.07 parts per million (ppm, whole coal basis). Chlorine contents vary between 100 and 1,700 ppm.

### Acknowledgments

The author wishes to thank Steve Greb and Drew Andrews, who assisted in the preparation of this chart.

### References Cited

Andrews, W.M., Jr., Andrews, R.E., and Hiatt, J.K., 2000. Coal resources of the Springfield coal bed in western Kentucky: Kentucky Geological Survey, series 12, Map and Chart Series 10, 1 sheet.



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