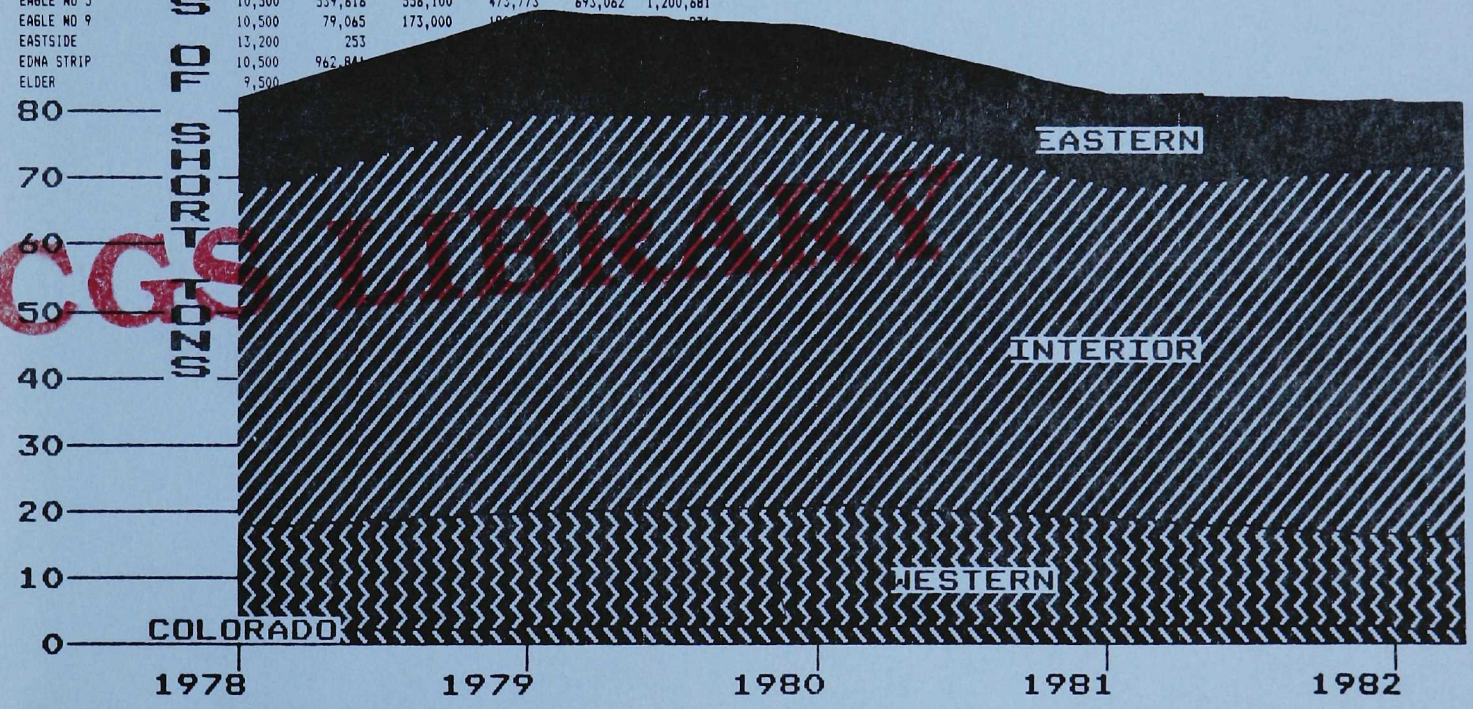
Norris

Special Publication 24

Analysis of the Colorado Coal Industry

by Peter Rushworth

BEAR	12,400	226,705	250,152	239,217	259,392	91,845
BEAR CREEK	13,000	44,171	46,100	5,282		
BLUE RIBBON	12,600	15,294	89,373	101,771	129,055	150,963
BOURG STRIP	9,640				94,634	76,614
CAMEO	11,800		31,800	229,655	283,072	124,634
CANADIAN STRIP	10,928	193,791	97,900	21,700	136,024	
CANON MONARCH	10,700		14,284			
CHIMNEY ROCK	13,230	38,676	78,786	8,425	255,013	259,477
CISSY LEE	12,600	3,592				
COAL BASIN	14,500	132,396	139,300	130,278	92,998	51,287
COAL GULCH	12,000	13,851	3,600			
COLORADO COAL NO 1	12,200					26,334
COLOWYO	10,728	1,072,113	1,699,400	2,642,084	3,130,390	3,153,419
DELAGUA NO 1	12,500	25,900	39,000			
DELAGUA NO 2	12,500	4,000		67,756		
DESERADO	10,100					32,113
DORCHESTER	11,100			73,317	172,599	584,832
DUTCH CREEK NO 1	14,500	161,208	147,100	156,533	45,386	77,463
DUTCH CREEK NO 2	14,000	225,464	208,200	181,145	257,492	241,927
EAGLE NO 5	10,500	539,616	556,100	473,773	693,062	1,200,681
EAGLE NO 9	10,500	79,065	173,000			
EASTSIDE	13,200	253				
EDNA STRIP	10,500	962,84				
ELDER	9,500					



NUCLA	11,680	102,394	121,800	93,069	60,260	61,237
NUGAP	10,500	281	113			
OHIO CREEK	11,500		269	1,447	2,211	7,103
ORCHARD VALLEY	11,000	435,896	722,470	761,824	976,796	1,246,197
PEACOCK	13,400		100	656	305	
RED CANYON NO 1	10,600	426	9,840	93,258	137,698	64,442
RIENAU NO 2	10,910	36,001	68,266	144,991	122,781	57,228
ROADSIDE	11,800	449,749	827,800	603,464	664,427	929,323
SENECA STRIP	10,700	1,372,251	1,611,805	1,778,916	1,227,945	1,313,711
SOMERSET	12,500	650,210	900,777	854,697	668,622	453,409
SUNLIGHT	12,610	487	471	884	989	1,218
THOMPSON CREEK NO 1	13,004	15,733	18,900	40,596	115,185	97,553
THOMPSON CREEK NO 3	13,760	18,207	14,000	1,812	4,469	11,736
TOMAHAWK	10,000	35,231	70,741	24,076	101,336	41,915
TRAPPER	9,800	1,332,985	2,328,700	2,014,376	2,093,012	2,001,106
TRINIDAD BASIN	13,000				65,039	71,739
TWIN PINES	10,500	36,691	37,124	34,872	22,099	
VIKING	13,012	16,342	49,682	23,515	37,014	1,858

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SPECIAL PUBLICATION 24

ANALYSIS
OF THE
COLORADO COAL INDUSTRY

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EXECUTIVE SUMMARY

The Colorado coal industry is adjusting to changes in demand and to changes in the corporate structure of coal-holding companies and coal-consuming industries. Coal buyers are dominantly utilities which gain monopoly power over coal sellers in times of excess capacity and are captive to the market in times of short supply.

Changes in demand for coal products leave the steam coal product market with increasing significance. The independent coal industry must react in accordance with utility needs and wishes, otherwise utilities will seek to integrate operations. The coal producers of the present are not the producers of the future. Organizations holding most coal are typically not large producers at this time.

Petroleum companies hold increasing reserves of coal, but most companies in the extraction industry maintain petroleum interests. Concentration of petroleum interests in the coal industry serves to increase competition. Changes in the structure of the petroleum industry, however, will alter the coal-holding and coal production scenario at the time of transaction.

Coal and petroleum do not compete directly and are not substitutable. In the short- to mid-term, coal will not significantly enter the transportation sector. On the other hand, the economics of coal use dictate that despite slowing, the trend of coal-fired generators replacing oil- and gas-fired generators will continue. Shortages of petroleum will not significantly improve the market for coal.

Economies-of-scale in surface-mining Colorado coal are restrained by the geologic setting of the coal body. Typically, Colorado coal is thinner, contained in greater numbers of seams and is structurally more complex than coal mined in the Powder River Basin of Wyoming and Montana. It is therefore unlikely that technology and/or new mines could significantly improve the productivity of Colorado's surface mines. Technology, however, is capable of increasing underground mine productivity. Longwall mining systems are increasingly emplaced or on order for underground mines. The longwall system is efficient, but highly capital-intensive. It is capable of dealing with steeply dipping, but continuous coal seams common in Colorado. Productivity, and hence, cost of coal will improve relative to that observed in conventional or continuous methods of underground mining.

Coal price originates in the geometry of the coal body, acquisition cost, extraction efficiency, wages and productivity. Distance and terrain factors influence transport cost, and when added to mining cost, determines delivered price. Purchasers discriminate between substitutes based on equivalent cost. Coal prices are set by the bargaining power of buyers and sellers. Spot market prices react more quickly to changes in coal demand than long-term contract prices. Buyer flexibility is retained through purchases solely on the spot market. Security in coal purchases is obtained through long-term contracts. Balancing purchases from both markets gives buyers a measure of price security and stability of supply.

Railroads created a market area for western coal by initiating unit train service. By disallowing access through rights-of-way, railroads have disenfranchised the only competition in bulk coal movement, the slurry pipeline. Long-standing methods of rail operation hamper coal marketability. Rail rates are based on historical cost and not actual cost. In other words, cost reductions available through new rail technology are not passed along to the consumer, but are embedded in return-on-investment to the railroad. Rail rates are different for different commodities and increases may be forgiven to selected customers.

Since 1978, rail rates increased faster than increases in the price of Colorado coal. Interstate rail hauls increased the delivered cost of coal 8.7 percent per year on a per million Btu basis. Intrastate rates resulted in a delivered cost of coal increasing at a rate of 9.9 percent per year, on average. Rapid increases in the delivered cost of Colorado coal prompt users to seek alternative sources.

Colorado is a relatively high-cost producer of coal. The marketshare of Colorado steam, met and residential/commercial coal is decreasing. The marketshare of Colorado industrial coal is increasing, but constituted only 15 percent of Colorado's 1983 domestic coal production. As in the product market, the geographic market for Colorado steam coal is also shrinking. Colorado coal products were in 27 state geographic markets in 1983 compared to 34 state geographic markets in 1982. Data suggest that at the eastern extent of the Colorado geographic market, western coals, including Colorado, are substituted by coals from the Eastern and Interior Coal Provinces. In the close-in market of Iowa, Nebraska, Kansas and Missouri, western producers are retaining marketshare, however, Colorado is losing to producers from other Rocky Mountain states. Texas and Mississippi are growth markets and marketshare of western coal producers doubled since 1978, and Eastern and Interior coal producers are losing marketshare. In the small Pacific market, Wyoming and Montana provided 90 to 96 percent of coal needs while Colorado marketshare decreased. Much of this decline is due to loss of the met coal market. Colorado is, not surprisingly, the most significant consumer of Colorado coal. However, Colorado is losing marketshare in its home base. Purchases of out-of-state coal are accelerating, and coal consumers are discriminating against Colorado coal, based, apparently, on relative price.

Statistical analysis indicates that a "pull-up" effect of increasing demand of Wyoming benefitting Colorado coal is nonexistent. Correlation of other Rocky Mountain producers and Colorado is significant only in the East and West South Central Market Region, Texas and Mississippi. A long-standing shift to western producers helps increase marketshare and production from all Western Coal Province producers.

Colorado coal is won from coal regions with varied geologic and topographic characteristics. Most production emanates from the Green River and Uinta Coal Regions. Between 1981 and 1983 the Uinta Coal Region increased production for the out-of-state market while production from the Green River Coal Region was down sharply for both in-state and out-of-state coal markets. The locus of production will shift south and east in Colorado to reduce the distance between production and areas of rapid growth in coal consumption. New coal production from the Raton Mesa Coal Region to serve the Texas and Mississippi markets is inevitable.

Colorado Coal Producers

In the first quarter of 1984 Texaco bought Getty, SoCal purchased Gulf and Damson Oil acquired Dorchester Gas. These takeovers involve a 23 percent share of 1983 Colorado coal production. Other mergers and acquisitions have exchanged coal properties since 1983. Williams Companies purchased Northwest Energy, holders of Hawk's Nest East and West, KN Energy acquired coal mines and properties from CF&I, Apache Energy and Minerals bought the Sunlight Mine in Garfield County and Perma Resources, in a joint venture, exchanged into Kaiser Steel coal holdings and markets. Other petroleum companies may have acquired a stake in the Colorado coal industry through obscure holding companies.

In much less than a year, a large share of actual and potential Colorado production changed hands, and, in most cases, furthers petroleum industry concentration in Colorado coal. Since 1981, petroleum-backed coal producers lost a 26 percent share of the market while overall production fell about 14 percent. It is probable that petroleum-backed Colorado coal companies absorbed most of the 2.3 million ton reduction in the Colorado steam coal product market since 1981.

Colorado Coal Consumers

Consumers of Colorado coal are situated over a wide geographic area, and have similarly diverse reasons for selecting Colorado coal. The importance of steam coal has increased although production is down to 12.2 million tons per year (mtpy) in 1983 from the peak 14.5 mtpy in 1981. The restructuring of the met coal industry shifted most points of demand to regions at the periphery of the present Colorado coal geographic market. Present met coal demand for Colorado is solely from the U.S. Steel plant in Provo, Utah. Met coal production peaked at 3.0 mtpy in 1979, and the 1983 production level was about 850,000 tpy. The industrial coal product market is the only market where increases in marketshare of Colorado production and increases in production are noted. In absolute terms, Colorado industrial coal product production increased from 1.0 mtpy in 1978 to 2.3 mtpy in 1983. Residential and commercial coal products are relatively unimportant, and have declined in overall significance despite increased production for this coal consumption sector.

Summary

The Colorado coal industry faces increasing competitive pressure on price and quality from price-searching domestic companies and low-cost foreign producers. It is inevitable that only low-cost mines and/or specialty producers survive. Cost-cutting, negotiations with transporters, tax breaks, incentives for consumption, research into coal utilization and improved marketing are essential to stabilization and growth of the Colorado coal industry.

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This analysis is necessarily a series of snapshots of the dynamic changes experienced by the coal industry. The basic concepts involve the time-frames in which the coal industry can adapt to changes in demand. They are listed as follows:

Short-Term	-	0 to 2 years
Mid-Term	-	2 to 5 years
Long-Term	-	5 or more years

These time-frames are moving targets since factors influencing coal consumption occur continuously. The 1973 Arab oil embargo and cutoff of Iranian oil imports in 1979 prompted new concepts of reliance on petroleum. Environmental, political and economic events also influence the coal industry.

The introduction of unit train service in the early 1960's opened up the Western market. Only in 1973 following the Arab oil embargo did Colorado production increase significantly. Recessions, embargos and legislation impacted the coal industry causing it to change or refine plans to produce coal. However, each new adjustment in the coal producing scenario was based on increasing production. Colorado coal production peaked in 1981, and is on decline, at least temporarily. National coal consumption apparently bottomed in 1982. This analysis of the Colorado coal industry focuses on the years 1978 through 1983.

Data were collected from different sources by different methods. It is certain that variations and discrepancies will be seen when comparing data from set to set. For example, State, Federal and the Keystone Coal Industry Manual production figures differ. State data are based on Colorado Geological Survey and Department of Mines numbers, but do not differentiate production from distributed and stockpiled coal. Federal data accounts for distributed and stockpiled coal. Federal sources of coal data typically do not include mines with less than 10,000 tpy production, whereas the intent of the State database is all inclusive. Differences may result from poor estimation of a non-response or error in entering data, such as substituting raw coal production for clean coal tonnages. Production data from Mine Safety and Health Administration is typically 97 to 98 percent of production reported to the Energy Information Administration. Coal distribution data from EIA coal production Districts 16 and 17 were corrected for distribution of New Mexico coal from the Raton Basin.

All opinions and conclusions in this report are my own, and do not necessarily reflect any State policy. I believe sufficient data are presented to allow the interested reader to engage in similar research for analysis of conclusions reached in this report, or to form a different viewpoint of the state of Colorado coal industry. Much basic data are incorporated in the sister publication "Forecast of the Colorado Coal Industry - Production and Employment" (Special Publication 25). Reorganization of the data, such as in redefining the geographic market, will change marketshare analysis.

Acquisition, modification and verification of data were the most significant impediments to the current study of the Colorado coal industry. A consistent, computer database would ease compilation of timely and useful data to the coal community. Methods of segregating and organizing data in this report bias results. For example, most producers in the conglomerate and consortium category (Section 4) maintain oil and gas operations, yet they were excluded from the group with petroleum parent companies. Since these data were compiled by hand it was not feasible to regroup data. In other words, the statistical validity of these groupings could not be checked.

Coal production data acquired by the State should be modified. Monthly reports are not adjusted consistently for non-response and employment data is often not realistic. In addition, it is not clear if clean or raw tons are reported or if employment is total employed or miners in production. The State no longer collects coal distribution data by county. The premise of Colorado Geological Survey Special Publication 25, a forecast of the coal industry, is that county distribution of coal may be used to predict employment.

The collection of coal production data by the State should be verified with Energy Information Administration and Mine Safety and Health Administration data on a regular basis. Coal distribution data, even on a simple percentage basis to various markets, would allow the State to analyze the viability of the coal industry. Replacing monthly production and employment reports with consistent quarterly reports including percent distribution to market would benefit the State.

Acknowledgements

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SECTION 1

1.0 COAL INDUSTRY STRUCTURE

The coal marketplace is composed of buyers with singular interests and sellers with varied interests. In addition, product quality, price and technology play a significant role in the desirability of coal as a commodity. Sellers of coal are separable by corporate structure, financial and political power and regional bias. There are at least seven main distinctions among coal sellers:

- Conglomerates/Consortiums - (Peabody, Dupont, W.R. Grace/Hanna)
- Petroleum-(Arco, Exxon, Sunedco, KN Energy)
- Independents-(North American Coal, Bear Coal)
- Utilities-(Nerco, Utah Power & Light, Colorado Ute Electric Coop.)
- Steel Companies-(U.S. Steel)
- Small Producers-(less than 100,000 tpy)
- Regional Product Miners-(East versus West)

Coal buyers are entities committed to combusting a depletable product. Utilities require a stable, uniform supply to match demand for electricity. As an industry, utilities are gaining power in coal purchases. However, there are many individual utilities and hundreds of coal sellers. It is likely that the coal industry will strive more and more to give the utilities the product and price requested with increasing degrees of reliability. Utilities seek long-term supply contracts from one reliable source. This prudent desire corresponds to an industry in the business of continuously supplying electricity to its customers. On the other hand, the the coal industry is not stable. Utilities counteract the instability of the coal industry by hoarding prior to an anticipated strike. This practice tends to distort production records in the months prior to UMWA strikes and reduces the impact of a strike on the coal buyer.

It is not surprising that utilities seek to integrate their operations into the coal supply business. Integration eases supply problems, and increases the utility's knowledge of the coal business. Furthermore, new mines attempt to emulate their utility customers by more or less continuous operation, large loading facilities for expediting unit-train transport and creation of incentives to keep mines non-union. Captive coal mines are mines dedicated to one customer, the owner/operator. Significantly, captive coal production in the utility industry increased from 2.2 percent in 1950 to 11.8 percent in 1981 (Keystone, 1982). Utilities not currently producing captive coal are increasingly likely to hold coal properties (GAO, 1975).

Table 1-1 reflects national production data after 1969, at which time the Federal Mine Health and Safety Act was passed. These regulations caused significant productivity decreases, forced marginal operators to leave the industry, and higher prices resulted. The large increase in price between 1973 and 1974 is mainly due to price increases on the spot market. The spot market price is higher than the average long-term contract price. Between 1973 and 1974 the Arab oil embargo and the anticipated 1974 UMWA strike, the spot market surged ahead to its correlative pricing to long-term contract coal. Spot market coal is used as a benchmark for contract coal prices. The large rise in spot coal prices initiated the rise in contract coal prices during this period. When the spot market price increased in 1973, utilities competed with expanding national and international demand for coal. Since it was necessary to purchase

TABLE 1-1 -- NATIONAL COAL PRODUCTION STATISTICS (MODIFIED AFTER KEYSTONE, VARIOUS YEARS)

ITEM	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982
PRODUCTION														
(t x 1000000)	560	602	552	595	592	603	648	678	691	665	776	824	818	820
VALUE														
($ x 1000000)	2,795	3,773	3,904	4,562	5,049	9,502	12,472	13,189	13,705	14,486	18,359	20,196	20,066	22,543
EXPORTS														
(t x 1000)	56,234	70,944	56,633	55,960	52,870	59,926	65,669	59,406	53,687	39,825	64,782	89,947	110,292	105,297
IMPORTS														
(t x 1000)	109	36	111	47	127	2,080	940	1,203	1,647	2,953	2,059	1,194	1,043	620
DOMESTIC USE														
(t x 1000000)	507	515	494	517	556	553	556	597	620	621	677	699	728	705
UNDERGROUND (%)	61.9	56.2	50.0	51.1	50.6	46.0	45.2	43.4	38.5	36.4	41.3	40.9	39.7	38.0
SURFACE (%)	38.1	43.8	50.0	48.9	49.4	54.0	54.8	56.6	61.5	63.6	58.7	59.1	60.3	62.0
FOB MINE ($/t)	$4.65	$5.89	$6.66	$7.35	$8.53	$15.75	$19.23	$19.43	$19.82	$21.78	$23.05	$24.57	$26.01	$27.50
RAIL ($/t)	$3.10	$3.41	$3.70	$3.67	$3.71	$4.71	$5.23	$5.86	$6.48	$7.32	$8.17	$9.48	$11.31	$12.50
TOTAL ($/t)	$7.75	$9.30	$10.36	$11.02	$12.24	$20.46	$24.46	$25.29	$26.30	$29.10	$31.22	$34.05	$37.32	$40.00

coal ~~at whatever~~ price, the price increased sharply. The long-term contract market simulates the captive coal market in that neither are available to the spot market. In addition, escalators and pass-through costs are negotiated so that the supplier does not absorb the cost of inflation; it is passed through to the consumer.

1.1 Competition

The 1978 Department of Justice report dealing with competition in the coal industry noted several problems in determining industry concentration. Production of coal, sales, and deliveries are not an appropriate measure of a firm's ability to produce in the future, since coal is a depletable asset. The study indicated that reserve holdings were more indicative of concentration since these data directly reflect the potential future production of a company.

The universe of uncommitted, non-Federal coal was used as the basis for computing the four- and ten-firm concentration ratios. It should be noted that the universe will change as more information is obtained. The reserve universe in 1982 was 472 billion tons according to the Keystone Coal Industry Manual. Table 1-2 shows the reserve base of the top ten holding companies in 1982. The top four firms hold 10.0 percent of current U.S. demonstrated reserves. The top ten firms hold 17.4 percent of the U.S. coal reserves. It is significant that the largest coal holder, Burlington Northern, is a railroad and cannot directly develop its reserves, although its subsidiary, Meridian Land, is set up to do so. Union Pacific, also a railroad, organized a holding company and has been in coal mining for some time. With the exception of North American Coal Company, the remainder of the top ten coal companies are held by petroleum firms. Table 1-3 lists the top ten coal producers of 1982. Of the top ten coal holders, Table 1-2, only four were among the top ten producers.

In 1974 the petroleum industry accounted for 19 percent of production and 14 percent of the demonstrated reserve base (GAO, 1977). Currently, 37 petroleum firms control 15 percent, or about 71.4 billion tons, of the demonstrated reserve base of the United States. Industry domination by petroleum companies is unlikely; furthermore, since coal and oil do not compete in the same markets it is likely that petroleum industry expansion is simply one method of diversification.

Although assuring competition in the coal industry is critical in Federal leasing decisions, other forms of competition will affect the coal industry in the mid-1980's. The United States coal industry faces increasing competition from foreign coals in price and quality. For example, Exxon's Cerrejon Project in Columbia will compete in many established American markets served by ports-of-entry. Coals from Poland, South Africa, China and Australia will displace American coals in our export market and at home to some extent.

Competition is increasing as market pressure forces down the price of coal. Coal producers become price-searchers, lowering the price of coal to find a market. Those producers able to survive will retain a market, others must leave the industry.

Table 1-2
Reserves Held By Top 10 Holding Firms, 1982
(After Keystone, 1983)

Rank	Firm	Reserves (Million Tons)	Percent
1	Burlington Northern	14,700	3.1
2	Continental Oil (Dupont)	13,700	2.9
3	Union Pacific	10,000	2.1
4	Exxon	9,200	1.9
5	Peabody	8,560	1.8
6	Phillips Petroleum	8,000	1.7
7	El Paso Natural Gas	5,600	1.2
8	North American Coal	5,200	1.1
9	Occidental Petroleum	3,800	0.8
10	Mobil	3,500	0.7

Total Non-Federal Universe = 472,700 million tons

Table 1-3
Top 10 Coal Producers, 1982
(Modified after Keystone, 1983)

Group or Company	Production (thousands of short tons)	Percent of 1982 Production
Peabody	57,685	6.9
Consolidation (Dupont)	46,962	5.6
AMAX	38,931	4.7
Texas Utilities	26,916	3.2
A.T. Massey (Royal Dutch Shell)	21,200	2.5
Island Creek (Occidental)	20,952	2.5
Anaconda	19,142	2.3
Exxon	18,594	2.2
Pittston	16,054	1.9
Nerco (Pacific Power & Light)	15,303	1.8

1982 Production = 832,524,000
(EIA, 1983)

1.1.1 Pricing Mechanisms

The availability of coal lands is the main determinant of pricing coal as a scarce good. The Federal government is the chief coal holder and as overseer of the resource is able to set the price of coal through leasing coal properties. Political, not economic, decisions drive the Federal coal leasing program. Lease bidding, in theory, extracts potential future profits above the opportunity cost and places them in the Treasury. Accelerated leasing keeps prices down by increasing supply. Lower coal prices induces lower cost coal but penalizes those producers buying at earlier, relatively higher prices, and tends to reduce the price of competitive fuels.

Profit-seeking companies seek to maximize the net present value of the resource over time. Developing coal depletes the asset leading to a greater expense within a mine and, as time passes, through the industry. As in all depletable resources the user must pay a premium to the owner of the coal. The premium is the present value of returns, or opportunity cost, given up by the owner for not waiting until later to develop the property. This is the rent paid for a scarce good.

If a coal body cannot be mined at a cost acceptable to the user it will not be mined. Within the universe of coal bodies like substitutes are available at a price. Coal mines of unequal size and differing coal quality are distributed in coal basins irregularly due to topography and ownership patterns. Depletion of coal in the supplier mines makes more distant, but lower mining-cost coal more attractive. Rewards accrue to the low-cost miner.

Coal mining costs originate in the geometry of the coal body and the mining method. The following are major cost areas in coal extraction:

- Geology
- Mining Method
- Capacity
- Labor (Productivity)
- Labor (Wages)
- Depletion
- Product Quality
- Royalties
- Taxes

Coal seam geometry dictates extraction efficiency associated with the selected mining method. Colorado coal formed under conditions different, and less favorable, than those of the Powder River Basin. Economies-of-scale are possible, but mine capacity of Colorado mines is limited. For example, the 1982 production from the Thunder Basin Mine in Wyoming exceeded total 1983 Colorado production.

Productivity at Colorado mines is increasing but apparently the productivity of surface mines has peaked, at least temporarily. Increases in productivity are from new underground mines, higher utilization and new equipment at underground mines. Productivity increases are essential to decreasing the relative average cost of Colorado coal. The effects of depletion are counteracted by continuing exploration for new coal properties and installation of new mines.

The ~~geologic forces~~ operating on Colorado coal created a wide array of coal products. Given time any of these coal products could be produced upon sufficient demand. In the short-term, coal product switching is constrained by limitations of existing mines. However, in the long-term, new mines may open to meet requirements of any new market. It is certain, therefore, that Colorado will never be shut out of meeting coal demand, however, price constraints will limit all markets.

Royalties and taxes act to increase the cost of coal to the consumer. If set as a fixed fee, low-cost coal is saddled with a higher percentage of surcharge, but remains the same relative price difference between low-cost and high-cost coal. On the other hand, if surcharges are a percentage of cost then high-cost coal bears a proportionately greater burden, the differential favors low-cost coal. Upon renewal of pre-1976 Federal leases royalty rates will increase from $0.15 to $0.17 per ton to eight percent of value for underground coal and 12.5 percent of value for surface coal (Colorado Mining Association, 1981). Colorado coal will pay higher taxes due simply to its higher cost, increasing the desirability of substitutes with the net result of market loss and drop in production.

1.1.2 Barriers-to-Entry

Large amounts of capital are required to start and run a mine. In most industries up-front capital requirements are a barrier-to-entry. However, with coal in the ground an asset is identifiable, it may be tested and proven. If a large parcel of land is available with sufficient reserves of desirable quality a long-term contract may be sought and obtained. With a contract and assured purchase of the supply, capital is generally available. According to GAO (1977) the new entrant should have mining expertise otherwise, without a track record, expectations are uncertain, but formation of joint ventures are a remedy (U.S. Bureau of Mines, 1976).

If output at the minimum efficient scale is large relative to the total market then economies-of-scale are a barrier-to-entry. Entry of a new mine at minimum efficient scale increases the supply, depressing prices and making marginal properties unprofitable. The addition of salable coal depresses market price to the level necessary to support the increased demand brought about by the added product.

Holding coal and obtaining reserves are also barriers-to-entry. Long-term contracts are unavailable to new participants without sufficient capital if no coal is held. In other words, control of reserves is equivalent to the entry requirement for capital formation. Overall, attempts to obtain reserves pushes up the price of reserves enough to eliminate excess profit (Department of Justice, 1978).

Similarly, the Federal Government is the prime force in the artificial restriction of coal company access to reserves. Restrictions or moratoriums on Federal leasing creates barriers-to-entry by holding back reserves. Through withholding, the cost of all reserves is increased. Due to Federal government positioning in the coal market some "costly" projects must be undertaken now whereas some future projects will be relatively low-cost. Royalty demands from the government will only partially offset the large future profit to be made by coal companies or railroads holding coal. The situation has arisen since the Federal government, the owner of most U.S. coal, decided to withhold coal from the market, essentially creating an artificial price support.

Due to the nature and geometry of coal bodies and markets for Colorado coal economies-of-scale are not barriers-to-entry. Small producers with specialty coal products and large producers with low-cost homogeneous coal products are both able to mine coal, and as markets permit, sell coal. Taxes, royalty payments and rent are not barriers-to-entry, although disproportionate royalty payments paid by relatively high-cost producers will create barriers-to-markets.

Taxes are not barriers-to-entry, but create disincentives. For example, Colorado unitary tax is often cited as a restriction on the formation of joint ventures and other countries shun operating in such an environment. A barrier-to-market is created since joint ventures with foreign concerns is a seeming prerequisite for a coal export market.

1.2 Integration

Integration of consuming industries into the coal industry has both positive and negative effects. Oligopolistic industries such as steelmakers or brewers have an incentive to produce the necessary quality and quantity of coal required for their process at the lowest cost. The economic profit which would have been due an independent coal operator is embedded in their final product. The lower cost of the final product is a cost advantage over competitors.

On the other hand, monopolistic industries, specifically utilities, are highly regulated and possibly lack the incentive to reduce mining costs. Consumers of coal-generated electricity pay for the mining cost regardless of the efficiency of mining. Utility-owned coal is an assured supply upon which boilers may be most effectively designed. Whether such stability could be obtained at lower cost from an independent source is a difficult question for regulatory agencies. However, competition within the electric utility industry will serve to increase efficiency and reduce costs.

1.2.1 Integration by Oligopolistic Industries

Profit-seeking coal-consuming industries have an incentive to diversify into coal to reduce costs. Met coal is an essential ingredient to steel-making. Integrated steel companies will have an advantage if captive met coal mines serve company needs. Surplus coal in this event can be sold on the spot market or may be exported since met coal is a high value commodity. Large industrial users may also benefit from integrating into coal if economies-of-scale justify the expansion. Locally, Coors Industries powers some of its industrial capabilities in glass and porcelain fabrication, as well as the brewery, by using Colorado coal from one captive mine and other sources.

1.2.2 Integration by Monopolistic Industries

Two monopolistic industries have stakes in the coal industry. Utilities are coal consumers and are presently the largest purchasers of coal. Railroads own coal lands but are prohibited from directly mining them. Both industries are regulated by government bodies. Railroads are excluded from the coal industry. The market power of railroads in coal is due to a subsidy by the U.S. government and exclusion of the railroads as coal producers is also due to regulation.

1.2.2.1 Railroads

Rail is currently the most widely available mode of bulk coal transport, railroads serve both the producer and the consumer. If railroads could mine coal under their land, effectively becoming a producer, then restricting the quality of rail service or altering the transport cost would bid the price of coal up. Railroads are not permitted to hold Federal leases or to mine coal except for their own use. The pattern of land ownership along land grant rights-of-way alternates in one square mile segments of railroad and Federal land on both sides of the right-of-way. The checkerboard pattern of land ownership means neither the Federal government nor the railroad can assemble enough land to plan an efficient mine. Although the coal is obviously well-located on a transport route the holding railroad is prohibited from transporting its own coal. Consequently, a stalemate exists. The railroad's method of by-passing legislation prohibiting railroad integration into the coal industry is to form a holding company.

1.2.2.2 Utilities

Integration of utilities into the coal industry allows several efficiencies. Most significantly, utilities producing from captive mines are not bound by long-term contracts with independents. Costs due to supply interruptions from other sources are minimized. Matching of coal mine production with utility needs are greatly improved, and this improved coordination may net lower operating costs.

Long-term contracts between independent mines and utilities are incomplete in that every possibility cannot be taken into account (Dept. Justice, 1978). A monopoly exists between buyer and seller. Avoiding this monopolistic situation and struggle for bargaining power and price over the opposite party is possible through vertical integration of the utility.

On the other hand, the inherent monopoly of electric utilities is not restrained by competitive forces, but by regulation. Price regulation covers distribution and power generation but usually not production of coal. Coal mining by a utility would be an area where an attempt to gain monopolistic profit could occur outside present regulation. Unchecked coal prices paid by a utility could lead to higher electricity costs resulting in transfer of income from electricity consumers to investors in electric utilities.

SECTION 2

2.0 MARKET STRUCTURE

The coal industry is capital-intensive and can react only slowly to changing economic circumstances. Time-frames for decision-making applied to the coal industry are specified as follows:

Short-Term

The short-term does not allow much leeway in meeting new market conditions. This time period is highly inelastic since expanded production must be preceded by extensive mine planning and equipment purchases. Existing mines can increase production by either increasing work time or opening new working sections with under-utilized equipment.

Mid-Term

The mid-term response of the coal industry is observed within two to five years. This is about the time needed to bring a mine already in the planning stages online to production. Increased storage or production capabilities are possible within this time period. In addition, new workers may be hired and trained to full productivity. However, within the mid-term, new companies may not be able to enter the market.

Long-Term

The long-term is a time period in excess of five years. New mines and reserves may be evaluated and brought into production. Older operating mines may be depleted and closed. The basic cost factors of the industry set the F.O.B. price of coal.

- Labor
- Transport/Transhipment
- Capital Requirements
- Government
- Reserves and Reserve Availability

In a competitive environment, the cost of coal will be closely correlated with these long-run average costs.

2.1 Coal Product and Geographic Markets

Coal was discovered near the base of the foothills 14 miles north of Golden in 1859. Significant Colorado coal mining began during the Civil War and grew to about one mtpy in 1880. The development of a concentrated energy resource was the initial impetus for manufacturing in Colorado. The emergence of coal as a major fuel source began as the supply of fuel wood depleted. Early nineteenth century applications of coal included specialty blacksmithing and ironwork. Early coal mining was highly labor-intensive, and sophisticated mechanization did not exist for extensive surface mining, therefore most coal was mined underground.

The expansion of the railroad system and development of the coal-fired steam engine greatly contributed to the consumption of coal. Railroads were the

chief consumer and transporter of coal. Secondary effects included expansion of the steel industry, paralleling railroad growth, and replacement of wood-based charcoal with coal for iron reduction. In addition, the desire to ship coal greatly expanded the transportation network of roads and rail.

Increasingly, coal was sought for industrial, residential and electrical generation. Although prices were relatively low through the 1920's and 1930's petroleum gained marketshare due to its regulated underpricing. The shift in industrial demand to non-coal fuel sources marked the second significant decline in the coal production curve. In 1945, reliance on coal was 50 percent of energy consumption, in 1973 marketshare of coal was 18 percent. Ironically, the railroads contributed to part of this decline. Railroad consumption dropped from 62 mtpy in 1950 to 0.1 mtpy in 1973 (Schmidt, 1976).

Coal is a heterogeneous product with widely variable chemical properties which influence its purchase and associated costs. A relatively high heating value indicates a relatively low transport cost per million Btu's, other factors being equal. Similarly, low heating value coals exhibit a high transport cost and must be used closer to its source in order to equilibrate total cost with the cost of coal from another source. Product and geographic markets are determined by the intrinsic value of a specific coal, the associated transport cost and the availability of substitutes at a comparable price.

2.1.1 Product Markets

The basic product markets of coal are:

- .Steam
- .Metallurgical (met)
- .Industrial/Specialty
- .Residential/Commercial

The largest product market is long-term contract steam coal for utilities. Typically, coal boilers are most efficient when one type of coal is used exclusively. Blending of coals from several sources is another method of achieving a relatively homogeneous product.

Overall, the coal product market is expanding on the domestic front, as Table 2-1 indicates. On average, the energy contribution of coal in quadrillion Btu's increased marketshare 2.6 percent per year since 1973 with respect to overall energy consumption. The marketshare of coal is about 22 percent of the total energy consumed in 1983. In absolute terms, coal provides increasing increments to a presently shrinking market demand for energy.

Following the "Energy Crisis" of 1973-1974 the long-term response of the coal consuming community was not observed until 1979 or about five years later. Between 1979 and 1983 the marketshare of coal increased from 19.0 to 22.5 percent or an average annual percent change of 4.3 percent per year. Coal use might be expected to expand at this rate at least in the short- to mid-term until relative equilibrium is reached for all forms of energy and competing fuels.

Table 2-1. DOMESTIC COAL CONSUMPTION
AND TOTAL ENERGY CONSUMPTION
(in Quadrillion Btu's)

Year	Domestic Coal Consumption	Total Energy Consumption	Percent
1973	12.903	74.212	17.4
1974	12.596	72.479	17.4
1975	12.601	70.485	17.9
1976	13.519	74.297	18.2
1977	13.848	76.215	18.2
1978	13.710	78.039	17.6
1979	14.983	78.845	19.0
1980	15.373	75.900	20.3
1981	15.860	73.940	21.4
1982	15.291	70.822	21.6
1983	15.850	70.454	22.5

(Modified from EIA Monthly Energy Review March, 1984)

Table 2-2 shows coal consumption trends in the electric utility industry. Coal consumption in this sector increased steadily since about 1960. Over half of the nation's electrical output is generated by coal combustion. Since 1979 electric utilities have increased marketshare of coal, in energy equivalents, from 46.68 percent to about 55.03 percent in 1983, yielding an average rate of increase of 4.2 percent per year. Coal consumption is most sensitive to changes in consumption by electric utilities. Political, environmental and economic uncertainties bearing on the coal industry will affect the prime consumers of coal in an uncertain fashion.

Table 2-3 reflects trends in coal consumption in the industrial sector. In energy equivalents, coal use dropped 4.60 percent per year since 1973 in this consumption group. Since 1979 the average decline in the marketshare of coal consumption is 3.54 percent per year. Included in this group are manufacturing, mining and steelmakers. A floor on the rate of decrease of coal consumption may be nearing since coal is essential to steelmaking and others are committed to coal by virtue of sunk costs and proximity of fuel supply.

Table 2-4 lists trends in coal consumption in the residential and commercial sectors. Since 1979 the average rate of increase, in energy equivalents, in coal consumption was 1.79 percent per year. This sector is most likely to be able to switch fuels to petroleum, natural gas or electricity and may be more sensitive to recessionary effects. Over the long-term, the residential and commercial sector will not be a significant market for coal sellers.

Table 2-2 CONSUMPTION OF COAL BY ELECTRIC UTILITIES
(in Quadrillion Btu's)

Year	Total Coal Consumed	Total Energy Consumed	Percent
1973	8.658	19.852	43.61
1974	8.535	20.023	42.63
1975	8.786	20.350	43.17
1976	9.720	21.573	45.06
1977	10.243	22.694	45.14
1978	10.236	23.722	43.15
1979	11.264	24.129	46.68
1980	12.122	24.501	49.48
1981	12.583	24.752	50.84
1982	12.582	24.271	51.84
1983	13.234	24.965	55.03

(Modified from EIA Monthly Energy Review, March 1984)

Table 2-3 CONSUMPTION OF COAL BY INDUSTRIAL SECTOR
(in Quadrillion Btu's)

Year	Total Coal Consumed	Total Energy Consumed	Percent
1973	3.984	31.463	12.66
1974	3.800	30.630	12.41
1975	3.602	28.343	12.71
1976	3.595	30.177	11.91
1977	3.394	31.021	10.94
1978	3.258	31.363	10.39
1979	3.532	32.567	10.85
1980	3.103	30.549	10.16
1981	3.109	29.208	10.64
1982	2.520	26.111	9.65
1983	2.422	25.932	9.34

(Modified from EIA, Monthly Energy Review, March 1984)

Table 2-4 CONSUMPTION OF COAL BY RESIDENTIAL AND COMMERCIAL SECTOR
(in Quadrillion Btu's)

Year	Coal Consumption	Total	Percent
1973	0.259	24.147	1.07
1974	0.260	23.729	1.10
1975	0.212	23.902	0.89
1976	0.206	25.020	0.82
1977	0.207	25.375	0.82
1978	0.215	26.084	0.82
1979	0.188	25.810	0.73
1980	0.147	25.654	0.57
1981	0.171	25.246	0.68
1982	0.189	25.638	0.74
1983	0.193	25.523	0.76

(Modified from EIA Monthly Energy Review, March 1984)

2.1.2 Geographic Markets

Geographic markets for coal radiate from historic centers of production. Concurrent surges in coal consumption by utilities and expansion of the geographic market for coal resulted from implementation of unit trains for coal delivery. The limit of a geographic market is set by the lowest-delivered cost coal. If transportation factors are equal the low cost producers set the floor or base price for coal. Geographic markets are defined by product quality and the availability of substitutes. The ability to discriminate among coals on a delivered equivalent cost basis is the arbiter of limit on the geographic market. Coal has a relatively low value per unit volume compared with other bulk goods. Low transport rates benefit market interpenetration.

Geographic markets change over time and may contain sub-markets for specialty coal or different coal products. For example, in 1978 Colorado steam coal was present in 11 states. However, in 1983 only seven states used Colorado steam coal. Table 2-5 shows the geographic change in Colorado coal product markets.

Listings of states within each market region consuming Colorado coal are presented in Sections 3.3.1 to 3.3.5.

TABLE 2-5 STATE GEOGRAPHIC MARKETS OF COLORADO COAL

Coal Product	1978	1979	1980	1981	1982	1983
Steam	11	10	11	9	11	7
Met	5	4	4	4	4	2
Industrial	14	12	12	12	14	15
Residential	5	6	8	5	5	3
Total	35	32	35	30	34	27

2.2 Transportation

2.2.1 Railroads

Long-distance movement of coal is achieved via rail transport within the existing transportation infrastructure. The advent of unit trains in the early 1960's served to increase the market area of western coal. Unit trains usually consist of 100 100-ton coal cars dedicated to one mine and one customer. The number of unit trains required is determined by the distance between buyer and seller, required production, on-site storage and train velocity.

Mines unable to meet production requirements for unit train use are allocated coal cars at the single car rate which often is 10 to 15 percent higher than unit train rates (King, personal commun., 1984). Small mines are at a disadvantage in entering an extra-regional coal product market unless the coal has an intrinsic value above the increased cost due to higher rail transport charges.

Coal transport is a significant revenue generator for the railroads and naturally seek to continue this service despite competition. The railroad industry enjoys significant barriers-to-entry and is able to reduce its price in the face of competition. The monopoly power of railroads in coal transport is reduced, as is price, given competition from slurry pipelines.

2.2.2 Slurry Pipelines

Slurry pipelines threaten a major source of revenue and railroad marketshare of bulk coal transport. It is not surprising that great efforts are expended by the railroads to delay or quash potential slurry pipelines.

Slurry pipelines have several advantages:

- Economy of scale
- Capital intensive
- Continuous operation

Disadvantages are:

- Scale of operation requires large consumer or consumer group
- Long construction lead time
- Requires right-of-way access
- Slurry media may require rights acquisition

Slurry media may be water, liquid carbon dioxide, methanol, ethanol or oil; in proper quantities all may be combusted directly with coal without separation.

2.3 Interfuel Substitutability

The physical character of the most common fossil fuels, coal and petroleum, greatly influences their use and desirability. Petroleum exists in either a fluid or gas phase. Extraction takes place from a fixed location and pressure differences move the substance to the well(s) for distribution. On the other hand, coal is a fixed solid and extraction must move with production.

The growth of coal and petroleum consumption was similar from the latter part of the nineteenth century until about 1920. Oil and gas production doubled from 1918 to 1930. Coal production fell from 579 million tons in 1918 to 467 million tons in 1930. The value of petroleum was artifically low and remained so due to regulation and the rule of capture. In the early part of the twentieth century the coal industry served roughly an equal marketshare to steel, utilities, industry, and railroad and domestic uses. Competition from oil and gas eliminated demand from railroads converting to diesel and sharply reduced demand from general industry, utilities and domestic use. The jump from coal to oil was a long-term substitution, and for reasons of convenience and sunk expenses it is unlikely to reverse, except in the utility sector.

The past disparity in price per unit of heat value was sufficient to move the marketshare of energy production in the direction of petroleum. Advanced petroleum depletion resulting from regulated under-pricing and over-production reversed the relative cost advantage in favor of coal. Regulation and tax laws from the 1950's through 1976 created disincentives for domestic petroleum production. As a result, foreign sources of petroleum increased marketshare. Supply shortages due to the the Arab oil embargo drove petroleum prices up and was a contributing factor to the rise in coal prices.

At the higher price for both coal and petroleum, production and exploration were greatly stimulated. Currently, there is an over-supply of both coal and

petroleum, and prices are falling. Since the incentive for fuel-switching in boilers was destroyed by the large price advantage of petroleum, domestic coal cannot substitute directly for petroleum.

Reduced oil prices are unlikely to affect growth in coal demand in the United States. In Europe due to more advanced depletion and higher mining costs, lower oil prices may tend to decrease coal consumption in favor of oil. In turn, this may reduce the market for U.S. coal exports. Lower oil prices are temporary and will increase as depletion of current producing wells increases cost. The long-term trend is to reduce petroleum consumption and over-supply of oil will be met with reduced prices regardless of OPEC desires. A lower benchmark price for oil should have little effect on coal prices or demand for coal in the United States (Perry, 1983).

The competitive front between coal and oil is relatively narrow (Department of Justice, 1978). Coal and oil would be closer competitors if coal-generated electricity were substituted for petroleum. For instance, if electric cars increase in numbers or synfuels from coal become economic then coal would compete with petroleum, although still only indirectly. Clearly, the main application for coal is in electrical generation, yet relatively few boilers are capable of switching from coal to oil or vice-versa.

2.3.1 Utilities

In the short run, potential and present users of coal are constrained by existing equipment. Current users of coal-only boilers must buy coal at the current price. In the short run, coal and nuclear power are substitutable only in the dispatch of generator load. However, the cost of externalties in the nuclear industry may soon overprice nuclear energy. Examples of nuclear power externalties are:

- Subsidized cost of fuel
- Cost of hazardous waste disposal
- Retirement of irradiated plants
- Politics of radioactivity

Coal presents externalties through sulfur and particulate emissions. Unlike nuclear power, coal is a known substance with a long history of use in application. Coal is not involved with the politics of radiation and the fuel cost is the real cost paid by the user. Furthermore, coal plants are retired on the basis of economics and may be returned to service if required. Nuclear plants have a limited service life and become too irradiated for service after a period of time and are thereafter unusable liabilities to the owner.

In the long run, potential coal users are not constrained by existing equipment. Time, in the long-run, allows a broader selection of fuels. The system chosen will be that which yields the lowest cost over the lifetime of the project. In the decision between coal and nuclear power the cost factors are not just the delivered cost of fuel, but capital costs, construction time and weighting of externalties.

Currently, coal and nuclear power compete in the area of new baseload power plants. Owing to reduced energy demand and high capital requirements, construction of new power plants is down. Utilities may defer new construction, defer retirement of old facilities or reduce reserve capacity. Therefore, the purchasers' decision on the relative demand for coal versus

nuclear power will not be known for some time.

In response to the economic downturn ending in 1983 and changes in consumer demand, utilities are slowing expansion plans and conversion of plants from petroleum to coal. Competition among electric producers is holding the relative cost of electricity down and initiating innovation. For example, Colorado-Ute sold a new generating unit to an investment group for leaseback (Rocky Mountain News, 1984).

The coal versus nuclear power decision may shift to coal as problems mount for nuclear power in the United States and technology improves the position of coal. Atmospheric fluidized-bed combustion (AFBC) units permit coal generators to be used as peaking devices. In addition, AFBC is well-suited to co-production of steam for district heating and electrical requirements. The passage of time has not similarly aided the technology or learning curve associated with nuclear power. However, the nuclear power industry appears more successful in other countries.

2.3.2 Steel

Steelmakers are the second largest users of coal. Metallurgical coal displays specific desirable properties in steelmaking and is obtained at a higher cost due to mining conditions than is steam coal. Coke is substitutable as a supply of heat so it is possible for steelmakers to blend met coal with lower quality coals to reduce the unit price and still meet the technical requirements. There is no current, cost-effective substitute for met coal in steelmaking.

The American steel industry is attempting consolidation to better compete with imports. Mergers increase productivity and reduce costs by abandoning antiquated plants and reinvesting in well-located and more modern facilities. Two steelmakers with coal-holdings in Colorado announced changes in corporate structure. U. S. Steel shut down several facilities, some in Utah, in late 1983, but will retain capacity in the west. Its coal requirements will be drawn from Colorado. On December 27, 1983 CF&I announced it was permanently closing four blast furnaces, two basic oxygen furnaces and coke ovens, according to the Rocky Mountain News.

2.3.3 Other Industrial Users

Applications of coal in other industries include:

- Process steam
- Electricity
- Space heat

The industries comprising these alternative users of coal are:

- Chemicals
- Paper
- Stone, refractory
- Primary metals
- Food

At the smaller scale generally inherent in these industries oil and coal are substitutable. Petroleum furnaces require less capital and storage and handling is simpler than with coal. Coal, however, retains a significant cost

advantage in terms of dollars per unit of heat value. Industrial buyers tend to purchase coal on the spot market which is generally at a higher price than the contract rate.

SECTION 3

3.0 ANALYSIS OF THE COLORADO COAL INDUSTRY

Colorado coal competes in specific product and geographic markets. These markets determine which coals are desirable, and therefore, the extent of mining which will occur. Markets are dynamic, changing with changing economic perceptions about relative prices of energy. Sunk costs prevent immediate fuel-switching among competing fuels when prices change.

Changes in demand force changes in product quantity and quality. In other words, as demand changes, different types of coal are required to satisfy this change. As the supply increases, cost is driven down, however, in a natural resource such as coal only a specific amount may be consumed regardless of price. Therefore, price decreases to a level commensurate with demand, and over-supply is rectified by companies scaling back, and either temporarily or permanently leaving the market.

Changing demand, over-supply and price reductions dictate that certain coals are favored over others. Colorado has a tremendous diversity of coal rank and attributes of coal. Changing demand may be met by shifting production from one coal basin to another, from met coal to steam coal, from subbituminous to low volatile bituminous. However, none of these shifts are smooth transitions. Abrupt changes in demand for a coal product may shutdown an important economic contribution to a region's economy. The new product demanded may not be available in Colorado since it is not possible to react swiftly in the short-term or mid-term. The long-term allows the new demand product be satisfied with new coal mines or new facilities.

When market changes occur the existing microeconomy of coal mines is often unable to meet the goal. Consumers find new sources of better or less expensive coal. Loss of marketshare is not necessarily a permanent result of changing demand. Any time a market shift takes place, a lag time in adjustment will occur. If a market correction is possible it will occur within the long-term time-frame and compete with the new market supplies. Colorado competes most with Wyoming in the steam coal product market. Wyoming produces mainly one form of coal, low-rank subbituminous coal. Rank of Colorado coal is, in general, much higher, however mining costs are significantly higher since mining conditions differ greatly. The price advantage enjoyed by Wyoming remains significant even when comparing equal heating value contents.

Increasing production in a coal region is possible, however this alternative may be constrained by land availability, leasing rights or in-mine economies-of-scale. Falling demand for a coal product may essentially omit an entire region from the coal market. Superior products, and the mix of relative coal desirability is separable by product quality and distance. Colorado's coal regions contribute to a diversified mix of coal products by virtue of variable geologic history, coalification processes and topography. Table 3-1 shows production statistics for 1982 and an estimate of 1983 production by coal region. Overall 1983 production decreased 10 percent from 1982 levels. Changes in production of individual coal regions are diagnostic of the value placed on coal by consumers.

The largest increase was experienced in the Denver Coal Region, due entirely to the demand requirements of one captive mine. The largest decrease was observed

in the Raton Mesa Coal Region where slacking demand for met coal forced shutdown of several relatively large mines. In terms of production, the largest loss was in the Green River Coal Region, where nearly one million tons less was produced in 1983 than 1982. The Green River and Uinta Coal Regions account for about 90 percent of Colorado coal production. Loss of marketshare of coals from these regions impact overall Colorado production most significantly.

TABLE 3-1
COAL PRODUCTION BY COLORADO COAL REGION
(Short Tons)

Coal Region	1982	1983 (est.)	Percent Change
Canon City	701,458	850,000	21.18
Denver	135,651	176,000	29.74
Green River	8,919,572	7,956,000	-10.80
North Park	191,449	119,000	-37.84
Raton Mesa	321,694	126,000	-60.83
San Juan River	441,782	359,000	-18.74
Uinta	7,768,598	7,050,000	- 9.25
TOTAL	18,480,204	16,636,000	- 9.98

Product markets change with time, and this fact is reflected in shifting of production from region to region. The first markets for Colorado coal were geographic. The Denver Coal Region was developed to feed a growing metropolitan area. Product markets developed later, the Raton Mesa Coal Region specialized in met coal and high heat value coals. Colorado developed around coal production and drew transportation infrastructure to these areas.

3.1 Coal Characteristics and Resources

Colorado coal production is from rocks of Upper Cretaceous to Eocene age. Upper Cretaceous coals formed in deltas along an epeiric sea bordered in turn by highlands. Sedimentary processes dominated in controlling the geometry of coal bodies. Upper Cretaceous delta-plain and back-barrier coals tend to be elongate with the depositional strike and are occasionally disrupted by crevasse splays, wants or distributary channels. In contrast, Paleocene and Eocene coals were influenced by a fresh-water regime in tectonically controlled intermontane basins.

Heating value and sulfur contents usually constitute the main user-interest in coal as a commodity. Heating values of Colorado coal vary widely, in part due to locally high geothermal gradients related to igneous activity. Differential subsidence and overburden accumulation also influence present, observed heating values. Most steam coal heating values range from 10,000 to 13,600 Btu/lb; met coal heating values range from 12,070 to about 14,000 Btu/lb, on an as-received basis (Ladwig, 1983). Most coals contain less than 0.8 percent sulfur.

Geologic and geographic considerations allow differentiation of coal regions within the state. Coal regions are listed in order of decreasing cumulative production through January 1, 1983. Coal quality data are from Colorado Geological Survey publications. The following coal regions follow nomenclature of the Colorado Geological Survey:

3.1.1 Raton Mesa Coal Region

The Raton Mesa Coal Region is defined by the base of the Upper Cretaceous Vermejo Formation. Locally upgraded by igneous intrusions, the coals in the Vermejo and Raton Formations are generally of coking quality. Of the two coal fields, Trinidad and Walsenburg, the Vermejo Formation of the Trinidad is the most significant in terms of production.

Coal quality data for the Raton Mesa Coal Region are summarized as follows:

TRINIDAD FIELD

	Raton Formation	Vermejo Formation
Moisture (%)	1.8 - 4.5	1.6 - 7.5
Volatile Matter (%)	34.4 - 40.3	32.2 - 39.1
Ash (%)	5.3 - 16.4	7.7 - 21.8
Sulfur (%)	0.4 - 1.1	0.5 - 1.0
Heating Value (Btu/lb)	10,169 - 13,871	11,430 - 13,510
Ash Fusion Temp. (°F)	2,055 - 2,800	2,290 - 2,910
Free-Swelling Index	0 - 8.5	0 - 6.5

WALSENBURG FIELD

	Raton Formation	Vermejo Formation
Moisture (%)	2.5 - 4.2	5.3 - 10.2
Volatile Matter (%)	---	36.4 - 38.0
Ash (%)	5.3 - 13.5	7.2 - 14.4
Sulfur (%)	0.4 - 1.0	0.4 - 1.3
Heating Value (Btu/lb)	12,660 - 13,340	11,050 - 12,880
Ash Fusion Temp. (°F)	2,230 - 2,730	2,210 - 2,840
Free Swelling Index	0	0

3.1.2 Green River Coal Region

The Green River Coal Region is defined by the base of the Upper Cretaceous Iles Formation. The two coal-bearing units, Iles and Williams Fork Formations, represent a stratigraphic thickness of about 3,400 feet. Younger coals in the Lance, Fort Union and Wasatch Formations are preserved towards the depocenter, however, they are not mined at present (Murray, 1978).

Coal quality data are presented for the "Middle Coal Group" of the Williams Fork Formation and the Iles Formation.

YAMPA FIELD

	Williams Fork Formation	Iles Formation
Moisture (%)	6.4 - 11.8	6.3 - 12.2
Volatile Matter (%)	33.8 - 39.0	---
Ash (%)	3.0 - 20.2	4.3 - 11.3
Sulfur (%)	0.3 - 0.9	0.3 - 0.9
Heating Value (Btu/lb)	9,871 - 12,440	11,090 - 12,560
Ash Fusion Temp. (°F)	2,140 - 2,890	2,250 - 2,780
Free Swelling Index	0 - 0.5	

3.1.3 Denver Coal Region

The Denver Coal Region consists of two separate coal-bearing sub-basins, the Denver Basin and the Cheyenne Basin (Ladwig, 1983). The Denver Basin is mapped at the base of the Upper Cretaceous Laramie Formation. The Laramie Formation coal zone is about 50 to 275 feet thick.

Coal quality for the Denver Coal Region is summarized as follows:

BOULDER-WELD FIELD

	Laramie Formation
Moisture (%)	13.7 - 29.1
Volatile Matter (%)	27.3 - 43.6
Ash (%)	3.5 - 12.7
Sulfur (%)	0.2 - 0.9
Heating Value (Btu/lb)	8,250 - 10,810
Ash Fusion Temp. (°F)	1,990 - 2,470
Free Swelling Index	0

COLORADO SPRINGS FIELD

Laramie Formation

Moisture (%)	19.0 - 26.2
Volatile Matter (%)	31.4 - 45.1
Ash (%)	5.6 - 20.8
Sulfur (%)	0.3 - 0.7
Heating Value (Btu/lb)	8,440 - 9,280
Ash Fusion Temp. (°F)	2,150 - 2,470
Free Swelling Index	0

SOUTHEAST/SOUTH CENTRAL FIELD

	Denver Formation	Laramie Formation
Moisture (%)	26.4 - 39.6	33.1 - 35.0
Volatile Matter (%)	19.3 - 42.7	30.8 - 44.2
Ash (%)	9.8 - 44.6	7.8 - 15.7
Sulfur (%)	0.2 - 0.6	0.4 - 1.1
Heating Value (Btu/lb)	3,636 - 6,803	6,150 - 7,340
Ash Fusion Temp. (°F)	2,480 - 2,530	2,140 - 2,400
Free Swelling Index	0	0

3.1.4 Uinta Coal Region

The Uinta Coal Region, located in west-central Colorado, is defined by the base of the Mount Garfield Formation. The Mount Garfield Formation is time-equivalent to the Iles Formation. The Williams Fork and Iles Formations are the coal-bearing formations. Most coals range from 2 to 15 feet in thickness. Locally, high geothermal gradients upgraded coals to coking quality and through anthracite to the graphite stage.

Coal quality data of the Uinta Coal Region are presented by field as follows:

BOOK CLIFFS FIELD

Iles Formation

Moisture (%)	3.3 - 14.0
Volatile Matter (%)	29.8 - 35.4
Ash (%)	4.9 - 23.3
Sulfur (%)	0.4 - 1.7
Heating Value (Btu/lb)	9,833 - 13,560
Ash Fusion Temp. (°F)	2,130 - 2,960
Free Swelling Index	0 - 1.0

CARBONDALE

Williams Fork Formation

Moisture (%)	0.8 - 4.0
Volatile Matter (%)	21.8 - 39.3
Ash (%)	3.4 - 6.7
Sulfur (%)	0.4 - 1.5
Heating Value (Btu/lb)	12,609 - 15,088
Ash Fusion Temp. (°F)	2,180 - 2,455
Free Swelling Index	1 - 9

CRESTED BUTTE FIELD

Williams Fork Formation

Moisture (%)	2.5 - 13.3
Volatile Matter (%)	---
Ash (%)	3.2 - 9.1
Sulfur (%)	0.4 - 1.9
Heating Value (Btu/lb)	11,400 - 14,170
Ash Fusion (°F)	2,130 - 2,480
Free Swelling Index	0

DANFORTH HILLS FIELD

	Iles Formation	Williams Fork Fm.
Moisture (%)	9.2 - 13.4	8.9 - 15.5
Volatile Matter (%)	---	---
Ash (%)	3.7 - 10.0	2.2 - 9.6
Sulfur (%)	0.4 - 0.6	0.3 - 1.4
Heating Value (Btu/lb)	11,200 - 11,970	10,140 - 11,790
Ash Fusion Temp. (°F)	2,210 - 2,990	2,210 - 2,910
Free Swelling Index	---	---

GRAND HOGBACK FIELD

Williams Fork Formation

Moisture (%)	4.0 - 4.8
Volatile Matter (%)	37.2 - 39.8
Ash (%)	6.1 - 10.4
Sulfur (%)	0.6 - 0.7
Heating Value (Btu/lb)	12,060 - 12,581
Ash Fusion Temp. (°F)	2,230 - 2,910
Free Swelling Index	1.0 - 1.5

GRAND MESA FIELD

Iles Formation

Moisture (%)	3.1 - 19.5
Volatile Matter (%)	30.4 - 35.0
Ash (%)	2.1 - 17.9
Sulfur (%)	0.5 - 2.2
Heating Value (Btu/lb)	8,298 - 13,489
Ash Fusion Temp (°F)	2,060 - 2,970
Free Swelling Index	-----

LOWER WHITE RIVER FIELD

Williams Fork Formation

Moisture (%)	11.2 - 14.1
Volatile Matter (%)	-----
Ash (%)	4.4 - 8.5
Sulfur (%)	0.4 - 0.5
Heating Value (Btu/lb)	10,800 - 11230
Ash Fusion Temp. (°F)	2,060 - 2,910
Free Swelling Index	0 - 1.5

SOMERSET FIELD

Williams Fork Formation

Moisture (%)	3.2 - 13.6
Volatile Matter (%)	35.3 - 37.7
Ash (%)	3.2 - 11.4
Sulfur (%)	0.5 - 0.8
Heating Value (Btu/lb)	10,040 - 13,453
Ash Fusion Temp. (°F)	2,145 - 2,810
Free Swelling Index	0 - 0.3

3.1.5 Canon City Coal Region

The Canon City Coal Region is geologically similar to the Raton Mesa Coal Region. The Canon City Coal Region is defined on a map by the base of the Upper Cretaceous Vermejo Formation.

Coal quality analyses for the Canon City Coal Region are presented as follows:

Vermejo Formation

Moisture (%)	5.4 - 11.9
Volatile Matter (%)	31.4 - 42.9
Ash (%)	4.6 - 14.8
Sulfur (%)	0.3 - 1.7
Heating Value (Btu/lb)	10,400 - 11,390
Ash Fusion Temp. (°F)	2,030 - 2,720
Free Swelling Index	------

3.1.6 San Juan River Coal Region

The San Juan River Coal Region is mapped at the base of the Dakota Formation. Coal-bearing zones are the Fruitland, Menefee and Dakota Formations. High geothermal gradients locally upgrade coals to coking quality.

Coal quality analyses for the San Juan River Coal region are as follows:

DURANGO FIELD

	Fruitland Formation	Menefee Formation
Moisture (%)	0.9 - 2.3	1.6 - 10.7
Volatile Matter (%)	20.8 - 23.6	36.2 - 42.1
Ash (%)	19.5 - 26.6	3.4 - 16.6
Sulfur (%)	0.7 - 0.8	0.6 - 1.3
Heating Value (Btu/lb)	11,230 - 12,140	10,860 - 14,700
Ash Fusion Temp.	------	2,020 - 3,000
Free Swelling Index	----	0 - 5.5

NUCLA FIELD

Dakota Formation

Moisture (%)	2.5 - 13.5
Volatile Matter (%)	32.6 - 36.1
Ash (%)	6.1 - 12.8
Sulfur (%)	0.5 - 1.1
Heating Value (Btu/lb)	10,010 - 13,380
Ash Fusion Temp. (°F)	2,620 - 2,910
Free Swelling Index	0 - 1.5

TONGUE MESA FIELD

Fruitland Formation

Moisture (%)	14.2 - 16.0
Volatile Matter (%)	36.0 - 47.3
Ash (%)	6.7 - 8.4
Sulfur (%)	0.5 - 0.9
Heating Value (Btu/lb)	9,350 - 10,200
Ash Fusion Temp. (°F)	2,450 - 2,480
Free Swelling Index	0

3.1.7 North Park Coal Region

Only North Park is host to any significant, current or historical coal production. The North Park Coal Region is mapped at the base of the Paleocene Coalmont Formation, although coals may intertongue with the underlying Upper Cretaceous Pierre Shale. The South Park Coal Region is stratigraphically similar to the Denver Basin and is mapped at the base of the Laramie Formation.

Coal quality data for the North Park Coal Region are summarized as follows:

COALMONT FIELD

Coalmont Formation

Moisture (%)	14.5 - 20.2
Volatile Matter (%)	29.3 - 37.3
Ash (%)	5.5 - 13.1
Sulfur (%)	0.6 - 1.0
Heating Value (Btu/lb)	6,520 - 9,570
Ash Fusion Temp. (°F)	2,060 - 2,570
Free Swelling Index	0

McCALLUM ANTICLINE FIELD

Coalmont Formation

Moisture (%)	12.0 - 16.1
Volatile Matter (%)	27.4 - 37.3
Ash (%)	2.1 - 19.2
Sulfur (%)	0.2 - 0.3
Heating Value (Btu/lb)	8,580 - 11,280
Ash Fusion Temp. (°F)	2,040 - 2,680
Free Swelling Index	0

3.2 Colorado Supply Product

3.2.1 Product Quality

Colorado coal regions produce coals of variable quality in varying amounts. Table 3-2 shows the overall production and selected coal quality characteristics from mines reporting coal sales distributions to the Colorado Geological Survey for 1981 and 1983. Differences for year-end figures are due to incomplete reporting (Rushworth, Kelso and Ladwig, 1984). Coal production declined about 10 percent from 1982 to 1983. In the same time period the heating value of Colorado coal fell slightly from 11,139 to 10,980 Btu/lb., or 1.43 percent. No change was observed in sulfur content in this time period. Changes in coal quality are due to the changes of individual mines increasing or decreasing production to meet the specific demand for their mine product.

Table 3-3 lists changes in coal quality data by coal region and mining method. In the aggregate, for both years analyzed, higher quality coal is exported from Colorado than is retained for in-state use. This is expected since high value coal can travel further and compete in a greater array of markets than can lower value coal.

In 1981, the weighted average heating value of coal sold in-state was 10,912 Btu/lb. Coal exported out-of-state had a weighted average heating value of 11,388 Btu/lb. Underground mines yielded coal with a weighted average heating value of 12,122 Btu/lb while exported coal showed a heating value of 12,235 Btu/lb and coal used in-state showed a value of 12,122 Btu/lb. Surface-mined coal was characterized by an aggregate heating value of 10,775 Btu/lb. In-state coal heating value was 10,738 Btu/lb and 10,834 Btu/lb for coal exported out-of-state.

In this analysis, 1983 coal production was characterized by a weighted average heating value of 10,980 Btu/lb. Underground mines produced coal with an overall heating value of 11,588 Btu/lb; in-state coal was 11,100 Btu/lb and export coal was 11,759 Btu/lb. Surface-mined coal consumed in-state averaged 10,519 Btu/lb, export coal was 10,893 Btu/lb yielding an overall weighted average of 10,670 Btu/lb. In general, Colorado coal mined by underground methods is about 10 percent higher in heating value than surface-mined coal.

Table 3-4 shows the change in marketshare of underground and surface-mined coal with respect to import-export of coal and coal region. Between 1981 and 1983 underground-mined coal gained marketshare in in-state consumption versus surface-mined coal. The ratio of surface to underground-mined coal ranged from 7:1 in 1981 to 4.5:1 in 1983 for in-state coal sales.

The out-of-state coal product and geographic market noted changes in marketshare as well. Underground-mined coal gained nearly a 10 percent increase in marketshare from 1981 to 1983. Surface-mined coal declined in marketshare almost 13 percent. The ratio of surface to underground-mined coal exported out of state was 1.5:1 in 1981 and almost 1:1 in 1983. Table 3-5 shows these data. Table 3-6 lists coal production and distribution by region and percent of total.

TABLE 3-2 PRODUCTION AND COAL QUALITY OF DISTRIBUTED COAL BY COAL REGION

COAL REGION	1981 TOTAL PRODUCTION	1983 ESTIMATED PRODUCTION	PERCENT CHANGE	1981 BTU/LB	1983 BTU/LB	PERCENT CHANGE	1981 SULFUR	1983 SULFUR	PERCENT CHANGE
CANON CITY	278,027	842,300	202.96	11,000	11,082	0.72	0.72	0.61	-18.67
DENVER	7,293	143,000	1,860.73	8,079	8,079	0.00	0.37	0.37	0.00
GREEN RIVER	9,635,164	7,956,000	-17.43	10,644	10,590	-0.51	0.46	0.45	-2.17
NORTH PARK	523,212	119,100	-77.24	10,623	10,037	-5.52	0.29	0.25	-13.79
RATON MESA	744,926	51,800	-93.05	13,094	13,000	-0.72	0.57	0.70	22.81
SAN JUAN	472,455	359,000	-24.01	13,074	13,017	-0.44	0.84	0.84	0.00
UINTA	6,597,433	6,834,900	3.60	11,552	11,377	-1.43	0.47	0.47	0.00
TOTAL	18,258,510	16,306,100	-10.69	11,139	10,980	-1.43	0.47	0.47	0.00

TABLE 3-3 PRODUCTION AND COAL QUALITY OF DISTRIBUTED COAL BY MINING METHOD AND COAL REGION

	1981 In-State Production	Btu/lb	Sulfur	1981 Out-of-State Production	Btu/lb	Sulfur	1983 In-State Production	Btu/lb	Sulfur	1983 Out-of State Production	Btu/lb	Sulfur
Canon City												
Underground	59,552	11,000	0.6	114,190	11,000	0.6	470,500	11,134	0.58	323,500	11,021	0.60
Surface	65,312	11,000	1.0	38,973	11,000	1.0	33,800	11,000	1.0	14,500	11,000	1.00
TOTAL	124,864	11,000	0.81	153,163	11,000	0.70	504,300	11,125	0.61	338,000	11,020	0.61
Denver												
Underground												
Surface	7,293	8,079	0.37				143,000	8,079	0.37			
TOTAL	7,293	8,079	0.37				143,000	8,079	0.37			
Green River												
Underground	289,458	10,572	0.41	530,176	10,504	0.40	304,000	10,571	0.41	435,900	10,516	0.40
Surface	6,792,303	10,657	0.46	2,023,227	10,650	0.46	5,600,900	10,545	0.46	1,615,200	10,771	0.45
TOTAL	7,081,761	10,654	0.46	2,553,403	10,620	0.45	5,904,900	10,547	0.46	2,051,100	10,717	0.44
North Park												
Underground												
Surface	30,766	10,859	0.36	492,446	10,609	0.29	2,900	10,800	0.2	116,200	10,018	0.25
TOTAL	30,766	10,859	0.36	492,446	10,609	0.29	2,900	10,800	0.2	116,200	10,018	0.25
Raton Mesa												
Underground	468,705	13,150	0.48							51,800	13,000	0.70
Surface	210,677	13,002	0.73	65,544	13,000	0.70				51,800	13,000	0.70
TOTAL	679,382	13,104	0.56	65,544	13,000	0.70				51,800	13,000	0.70
San Juan												
Underground	9,310	13,529	0.84	133,450	13,529	0.84	10,800	13,529	0.84	43,300	13,529	0.84
Surface	82,119	11,820	0.81	247,576	13,230	0.85	59,400	11,680	0.81	245,500	13,230	0.85
TOTAL	91,429	11,994	0.82	381,026	13,334	0.85	70,200	11,964	0.81	288,800	13,274	0.85
Uinta												
Underground	370,058	12,178	0.51	2,664,328	12,568	0.55	642,900	11,286	0.48	3,276,500	11,974	0.53
Surface	1,162,102	10,728	0.4	2,400,945	10,728	0.4	583,100	10,728	0.4	2,332,400	10,728	0.4
TOTAL	1,532,160	11,078	0.43	5,065,273	11,696	0.48	1,226,000	11,020	0.44	5,608,900	11,456	0.48
GRAND TOTAL												
Underground	1,197,083	12,122	0.48	3,442,144	12,235	0.54	1,428,200	11,100	0.50	4,079,200	11,759	0.52
Surface	8,350,572	10,738	0.47	5,268,711	10,834	0.44	6,423,100	10,519	0.46	4,375,600	10,893	0.45
TOTAL	9,547,655	10,912	0.47	8,710,855	11,388	0.48	7,851,300	10,625	0.47	8,454,800	11,311	0.49

TABLE 3-4 PERCENT COAL DISTRIBUTION BY MINING METHOD AND COAL REGION

COAL REGION	1981 In-State	1981 Out-of-State	1983 In-State	1983 Out-of-State
Canon City				
Underground	21.4	41.1	55.9	38.4
Surface	23.5	14.0	4.0	1.7
Total	44.9	55.1	59.9	40.1
Denver				
Underground	-	-	-	-
Surface	100.0	0	100.0	0
Total	100.0	0	100.0	0
Green River				
Underground	3.0	5.5	3.8	5.5
Surface	70.5	21.0	70.4	20.3
Total	73.5	26.5	74.2	25.8
North Park				
Underground	-	-	-	-
Surface	5.9	94.1	2.4	97.6
Total	5.9	94.1	2.4	97.6
Raton Mesa				
Underground	62.9	0	0	0
Surface	28.3	8.8	0	100.0
Total	91.2	8.8	0	100.0
San Juan				
Underground	2.0	28.2	16.5	12.1
Surface	17.4	52.4	16.5	68.4
Total	19.4	80.6	19.5	80.5
Uinta				
Underground	5.6	40.4	9.4	47.9
Surface	17.6	36.4	8.5	34.1
Total	23.2	76.8	17.9	82.0

TABLE 3-5 MARKETSHARE OF DISTRIBUTED COLORADO COAL PRODUCTION BY MINING METHOD

MINING METHOD	1981 PRODUCTION IN-STATE	PERCENT OF TOTAL	1983 PRODUCTION IN-STATE	PERCENT OF TOTAL	PERCENT CHANGE	1981 PRODUCTION OUT-OF-STATE	PERCENT OF TOTAL	1983 PRODUCTION OUT-OF-STATE	PERCENT OF TOTAL	PERCENT CHANGE
Underground	1,197,083	6.56	1,428,200	8.76	19.31	3,442,144	18.85	4,079,200	25.02	18.51
Surface	8,350,572	45.74	6,423,100	39.39	-23.08	5,268,711	28.86	4,375,600	26.83	-16.95
TOTAL	9,547,655	52.30	7,851,300	48.15	-17.77	8,710,855	47.11	8,454,800	51.85	- 2.94

TABLE 3-6 MARKETSHARE OF IN-STATE AND OUT-OF-STATE COAL PRODUCTION AND DISTRIBUTION BY COAL REGION, 1981 AND 1983

COAL REGION	1981 PRODUCTION IN-STATE	1983 PRODUCTION IN-STATE	1981 IN-STATE MARKETSHARE	1983 IN-STATE MARKETSHARE	1981 PRODUCTION OUT-OF-STATE	1983 PRODUCTION OUT-OF-STATE	1981 OUT-OF-STATE MARKETSHARE	1983 OUT-OF-STATE MARKETSHARE
Canon City	124,864	504,300	1.31	6.42	153,163	338,000	1.76	4.00
Denver	7,293	143,000	0.08	1.82				
Green River	7,081,761	5,904,900	74.17	75.21	2,553,403	2,051,100	29.31	24.26
North Park	30,766	2,900	0.32	0.04	492,446	116,200	5.65	1.37
Raton Mesa	679,382		7.12		65,544	51,800	0.75	0.61
San Juan	91,429	70,200	0.96	0.89	381,026	288,800	4.37	3.42
Uinta	1,532,160	1,226,000	16.05	15.62	5,065,273	5,608,900	58.15	66.34
TOTAL	9,547,655	7,851,300	100.00	100.00	8,710,855	8,454,800	100.00	100.00

3.3 Colorado Demand Product

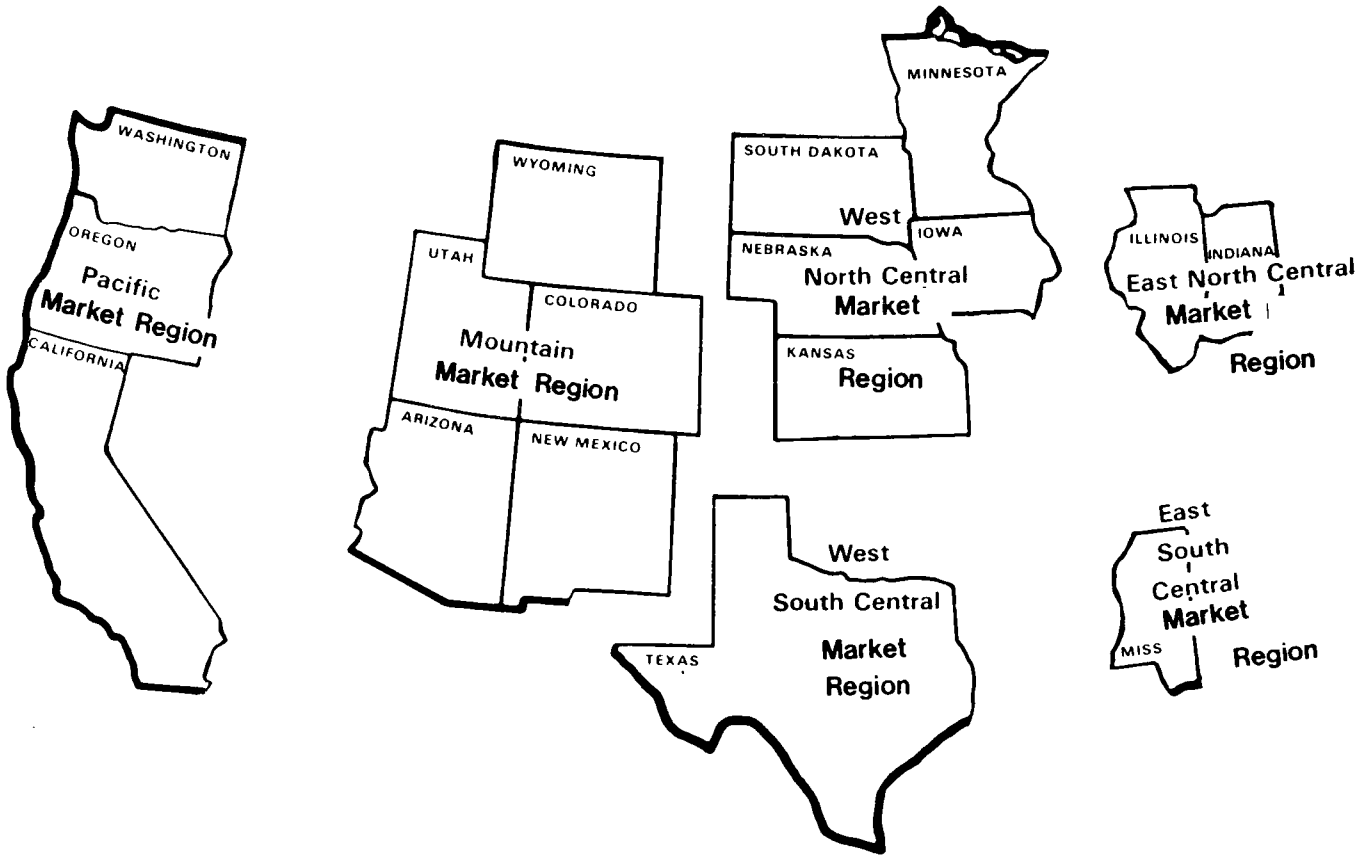
Demand for Colorado coal is down in three out of four product markets. Steam, met and residential applications show declines, and only industrial coal from Colorado exhibits strength in the marketplace. The geographic market encompasses fewer than 20 states from the Pacific Northwest to the Gulf Coast. Coal consumption is influenced locally by climate conditions, industry and rate of changeover from oil and gas to coal conversions.

Geographic markets are states which purchase Colorado coal. The basis for geographic market definitions are census regions used for data collection purposes by the Federal government. In turn, Census Regions designate geographic areas with similarities in climate, physiography, industry and population demographics. States within a census region do not universally accept Colorado coal, even within the Mountain Census Region. Therefore, the term "market region" is applied to those states within specific census regions which do consume coal from Colorado. The following market regions are recognized as purchasers of Colorado coal:

- East North Central Market Region
- West North Central Market Region
- East and West South Central Market Region
- Mountain Market Region
- Pacific Market Region

Figure 3-1 shows the market regions of Colorado coal as defined in this report. Market regions and states where Colorado coals are sold were examined for trends in coal consumption and geographic preference of origin of coal products. Trends in coal purchases are summarized by market region, and data are presented for each state market within the region. Data are from EIA Coal Distribution Reports. Consumption is equated with distribution in this analysis. Data for the year 1983 are annualized from the first three quarters of 1983.

FIGURE 3-1 GEOGRAPHIC MARKET REGIONS OF COLORADO COAL (from EIA Coal Distribution Reports)



3.3.1 East North Central Market Region

The portion of the East North Central Market Region significant to Colorado coal producers is composed of the states of Illinois and Indiana. Table 3-7 shows the total coal consumption of Illinois and Indiana by coal product. Table 3-8 lists coal consumption data for Illinois and Table 3-9 lists similar data for Indiana.

The only significant market for Colorado coal is the steam coal product. Steam coal consumption peaked in 1980 in the East North Central Market Region and since 1981 has stabilized at about 63 mtpy. This region is shifting steam coal purchases to the Interior and Eastern Coal Provinces. Table 3-10 lists the marketshare of point-of-origin coal in the East North Central Market Region.

In 1978, the Interior Coal Province provided the East North Central Market Region with about 67 percent of its steam coal needs. In 1983 the marketshare of Interior Coal Province steam coal was about 72 percent. Western coal, Rocky Mountain and Colorado held 28.4 percent of the East North Central Market Region steam market in 1978. However, in 1983 this figure dropped to about 24 percent.

East North Central Market Region utilities are shifting purchases from west to east at the same time that overall coal consumption is nearly unchanged. In 1978, Colorado shipped 304,000 tons to the East North Central Market Region for industrial and residential coal product markets. Since 1978 Colorado made insignificant contributions to these markets. In 1983, 16,000 tons were shipped to Indiana for met coal applications. Figure 3-2 shows point-of-origin data.

TABLE 3-7 ORIGIN OF COAL CONSUMED IN EAST NORTH CENTRAL MARKET REGION
(In Thousands of Short Tons)

	1978	1979	1980	1981	1982	1983
STEAM						
Eastern	2,795	2,421	1,503	1,436	1,212	2,693
Interior	40,838	47,764	48,252	40,978	46,070	45,263
Rocky Mtn.	15,101	17,122	18,189	16,096	13,842	13,905
Colorado	2,242	2,970	2,627	2,797	2,448	1,291
TOTAL	60,976	70,277	70,571	61,307	63,572	63,152
MET						
Eastern	10,464	11,723	10,793	10,518	7,310	8,299
Interior	2,396	3,012	2,943	2,391	2,290	2,380
Rocky Mtn.	-0-	-0-	-0-	-0-	-0-	-0-
Colorado	-0-	-0-	-0-	-0-	-0-	16
TOTAL	12,860	14,735	13,736	12,909	9,600	10,695
INDUSTRIAL						
Eastern	1,008	1,227	1,184	1,793	1,094	1,156
Interior	6,660	8,531	6,794	6,042	6,270	6,164
Rocky Mtn.	232	130	-0-	-0-	-0-	-0-
Colorado	269	7	-0-	-0-	17	11
TOTAL	8,169	9,895	7,978	7,835	7,381	7,331
RESIDENT/COM.						
Eastern	73	32	20	31	49	55
Interior	120	95	353	510	843	948
Rocky Mtn.	26	2	-0-	-0-	-0-	-0-
Colorado	35	-0-	-0-	-0-	-0-	-0-
TOTAL	254	129	373	541	892	1,003
TOTAL						
Eastern	14,340	15,403	13,500	13,778	9,665	12,203
Interior	50,014	59,402	58,342	49,921	55,473	54,755
Rocky Mtn.	15,359	17,254	18,189	16,096	13,842	13,905
Colorado	2,554	2,977	2,627	2,797	2,465	1,318
TOTAL	82,267	95,036	92,658	82,592	81,445	82,181

TABLE 3-8 ORIGIN OF COAL CONSUMED IN ILLINOIS
(In Thousands of Short Tons)

	1978	1979	1980	1981	1982	1983
STEAM						
Eastern	1,284	1,572	733	949	802	1,165
Interior	19,368	20,598	19,858	16,761	19,510	18,856
Rocky Mtn.	10,800	13,331	14,286	12,084	10,361	10,940
Colorado	1,743	1,767	1,631	2,026	1,445	551
TOTAL	33,195	37,268	36,508	31,820	32,118	31,512
MET						
Eastern	1,482	1,572	1,445	1,343	850	1,092
Interior	649	531	607	385	399	384
Rocky Mtn.	-0-	-0-	-0-	-0-	-0-	-0-
Colorado	-0-	-0-	-0-	-0-	-0-	-0-
TOTAL	2,131	2,103	2,052	1,728	1,249	1,476
INDUSTRIAL						
Eastern	286	502	699	518	555	593
Interior	2,412	2,627	2,631	2,237	2,072	2,105
Rocky Mtn.	205	130	-0-	-0-	-0-	-0-
Colorado	261	-0-	-0-	-0-	-0-	-0-
TOTAL	3,164	3,259	3,330	2,755	2,644	2,698
RESIDENT/COM.						
Eastern	53	22	15	14	7	8
Interior	104	65	138	203	303	309
Rocky Mtn.	26	2	-0-	-0-	-0-	-0-
Colorado	26	-0-	-0-	-0-	-0-	-0-
TOTAL	209	89	153	217	310	317
TOTAL						
Eastern	3,105	3,668	2,892	2,824	2,214	2,858
Interior	22,533	23,821	23,234	19,586	22,284	21,654
Rocky Mtn.	11,031	13,463	14,286	12,084	10,361	10,940
Colorado	2,030	1,767	1,631	2,026	1,462	551
TOTAL	38,699	42,719	42,043	36,520	36,321	36,003

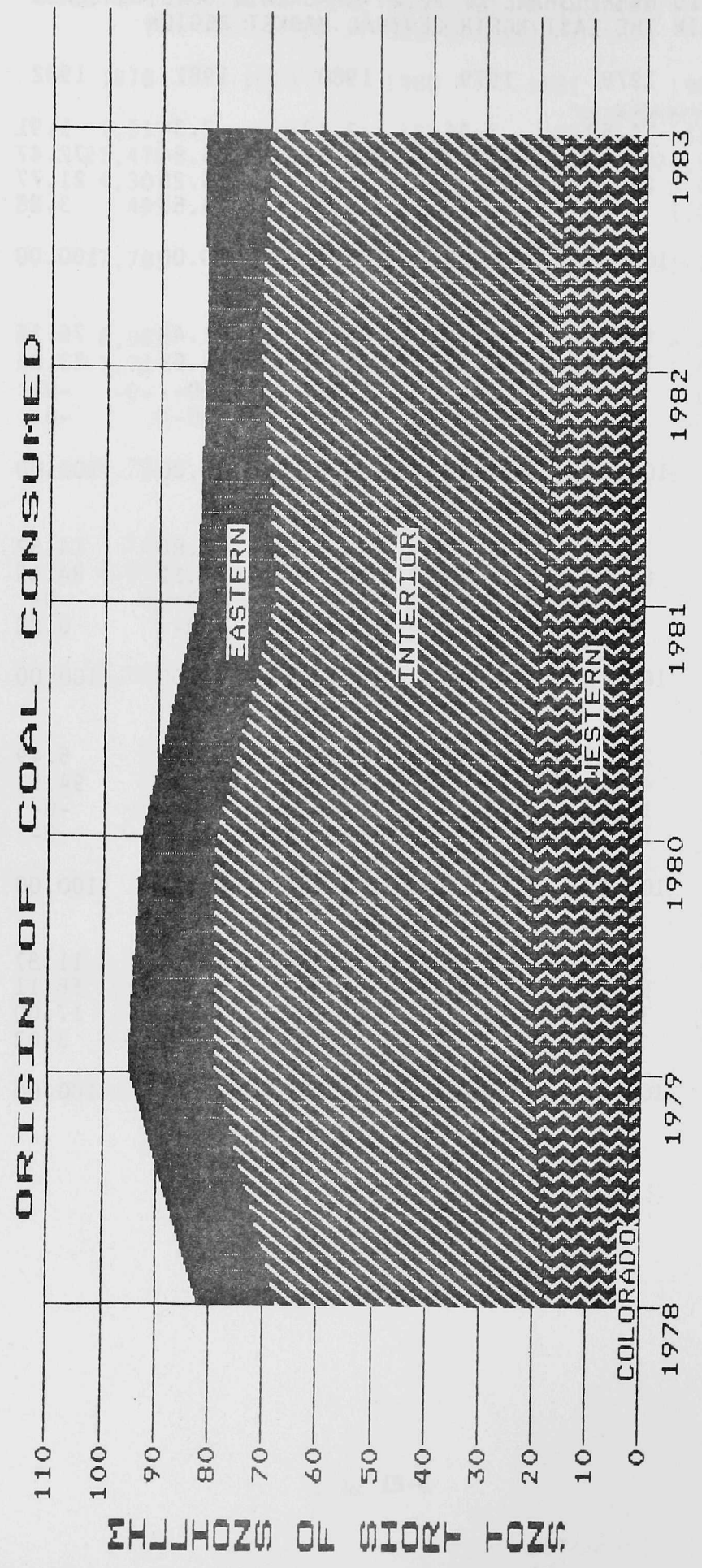
TABLE 3-9 ORIGIN OF COAL CONSUMED IN INDIANA
(In Thousands of Short Tons)

	1978	1979	1980	1981	1982	1983
STEAM						
Eastern	1,511	849	770	487	410	1,528
Interior	21,470	27,166	28,394	24,217	26,560	26,407
Rocky Mtn.	4,301	3,791	3,903	4,012	3,481	2,965
Colorado	499	1,203	996	771	1,003	740
TOTAL	27,781	33,009	34,063	29,487	31,454	31,640
MET						
Eastern	8,982	10,151	9,348	9,175	6,460	7,207
Interior	1,747	2,481	2,336	2,006	1,891	1,996
Rocky Mtn.	-0-	-0-	-0-	-0-	-0-	-0-
Colorado	8	-0-	-0-	-0-	-0-	16
TOTAL	10,737	12,632	11,684	11,181	8,351	9,219
INDUSTRIAL						
Eastern	722	725	485	1,275	539	563
Interior	4,248	5,904	4,163	3,805	4,198	4,059
Rocky Mtn.	27	-0-	-0-	-0-	-0-	-0-
Colorado	8	7	-0-	-0-	-0-	-0-
TOTAL	5,005	6,636	4,648	5,080	4,737	4,622
RESIDENT/COM.						
Eastern	20	10	5	17	42	47
Interior	16	30	215	307	540	639
Rocky Mtn.	-0-	-0-	-0-	-0-	-0-	-0-
Colorado	9	-0-	-0-	-0-	-0-	-0-
TOTAL	45	40	220	324	582	686
TOTAL						
Eastern	11,235	11,735	10,608	10,954	7,451	9,345
Interior	27,481	35,581	35,108	30,335	33,189	33,101
Rocky Mtn.	4,328	3,791	3,903	4,012	3,481	2,965
Colorado	524	1,210	996	771	1,003	756
TOTAL	43,568	52,317	50,615	46,072	45,124	46,167

TABLE 3-10 MARKETSHARE OF POINT-OF-ORIGIN COAL CONSUMED IN THE EAST NORTH CENTRAL MARKET REGION

	1978	1979	1980	1981	1982	1983
STEAM						
Eastern	4.58	3.44	2.13	2.34	1.91	4.26
Interior	66.97	67.97	68.37	66.84	72.47	71.67
Rocky Mtn.	24.77	24.36	25.77	26.25	21.77	22.02
Colorado	3.68	4.23	3.72	4.56	3.85	2.04
TOTAL	100.00	100.00	100.00	100.00	100.00	100.00
MET						
Eastern	81.37	79.56	78.57	81.48	76.15	77.60
Interior	18.63	20.44	21.43	18.52	23.85	22.25
Rocky Mtn.	-0-	-0-	-0-	-0-	-0-	-0-
Colorado	-0-	-0-	-0-	-0-	-0-	0.15
TOTAL	100.00	100.00	100.00	100.00	100.00	100.00
INDUSTRIAL						
Eastern	12.34	12.40	14.84	22.88	14.82	15.77
Interior	81.53	86.22	85.16	77.12	84.95	84.08
Rocky Mtn.	2.84	1.31	-0-	-0-	-0-	-0-
Colorado	3.29	0.07	-0-	-0-	0.23	0.15
TOTAL	100.00	100.00	100.00	100.00	100.00	100.00
RESIDENT/COM.						
Eastern	28.74	24.81	5.36	5.73	5.49	5.48
Interior	47.24	73.64	94.64	94.27	94.51	94.52
Rocky Mtn.	10.24	1.55	-0-	-0-	-0-	-0-
Colorado	13.78	-0-	-0-	-0-	-0-	-0-
TOTAL	100.00	100.00	100.00	100.00	100.00	100.00
TOTAL						
Eastern	17.43	16.21	14.57	16.68	11.87	14.85
Interior	60.79	62.50	62.96	60.44	68.11	66.63
Rocky Mtn.	18.67	18.16	19.63	19.49	17.00	16.92
Colorado	3.10	3.13	2.84	3.39	3.03	1.60
TOTAL	100.00	100.00	100.00	100.00	100.00	100.00

FIGURE 3-2 ORIGIN OF COAL CONSUMED IN EAST NORTH CENTRAL MARKET REGION



3.3.2 West North Central Market Region

The West North Central Market Region is composed of the states of Iowa, Kansas, Nebraska, Minnesota, Missouri and South Dakota. Oklahoma was excluded since it received only an insignificant, 14,000 ton, met coal shipment from Colorado in 1979.

Since 1980, overall consumption of coal in this market region stabilized at 70 mtpy. Met coal and industrial coal product consumption declined while steam coal product consumption hovered at the 65 mtpy level, in 1983. Residential/commercial coal products are at about the 500,000 tpy level of consumption.

Table 3-11 aggregates coal consumption for the West North Central Market Region. Tables 3-12, 3-13, 3-14, 3-15, 3-16 and 3-17 list individual coal consumption trends for Iowa, Kansas, Nebraska, Minnesota, Missouri and South Dakota, respectively.

Missouri is the largest consumer of steam coal in the region, currently at a level of 23 mtpy. In addition, Missouri is the only consumer of met coal although use of this coal product declined 67 percent since 1978. Industrial coal use in the West North Central Market Region is led by Iowa with a relatively consistent level of 1.4 mtpy. Residential and commercial coal use is highly variable in all states.

Table 3-18 lists trends in the marketshare of coal point-of-origin within the West North Central Market Region. The West North Central Market Region is well-located with respect to coal regions. Many states produce their own coal from the Interior Coal Province and are served by several rail lines.

Over the last six years the West North Central Market Region typically obtained 40 percent of its coal needs from the Interior Coal Province and 60 percent from other sources. Rocky Mountain coal producers provide most of West North Central's remaining coal requirements. Colorado is providing decreasing increments of coal to a market which has recently stabilized. Figure 3-3 shows point-of-origin data graphically.

TABLE 3-11 ORIGIN OF COAL CONSUMED IN WEST NORTH CENTRAL ~~MARKET REGION~~
(In Thousands of Short Tons)

	1978	1979	1980	1981	1982	1983
STEAM						
Eastern	424	838	1,025	367	165	132
Interior	22,441	24,956	24,680	22,346	25,150	25,198
Rocky Mtn.	30,066	35,611	38,087	39,467	39,384	39,942
Colorado	1,484	1,754	1,552	892	543	284
TOTAL	54,415	63,159	65,344	63,072	65,242	65,556
MET						
Eastern	643	227	133	124	102	59
Interior	46	88	74	31	3	-0-
Rocky Mtn.	-0-	-0-	-0-	-0-	-0-	-0-
Colorado	-0-	-0-	-0-	-0-	-0-	-0-
TOTAL	689	315	207	155	105	59
INDUSTRIAL						
Eastern	472	531	419	366	325	185
Interior	2,495	3,088	2,889	2,451	2,890	2,772
Rocky Mtn.	1,862	1,560	1,059	1,151	1,169	805
Colorado	320	411	272	252	300	132
TOTAL	5,149	5,590	4,639	4,220	4,684	3,894
RESIDENT/COM.						
Eastern	30	9	77	22	27	26
Interior	96	169	142	298	269	288
Rocky Mtn.	57	84	120	177	176	126
Colorado	2	10	18	13	12	51
TOTAL	185	272	357	510	484	491
TOTAL						
Eastern	1,569	1,605	1,654	879	619	402
Interior	25,078	28,301	27,785	25,126	28,312	28,258
Rocky Mtn.	31,985	37,255	39,266	40,795	40,729	40,873
Colorado	1,806	2,175	1,842	1,157	855	467
TOTAL	60,438	69,336	70,547	67,951	70,515	70,000

TABLE 3-12 ORIGIN OF COAL CONSUMED IN IOWA
(In Thousands of Short Tons)

	1978	1979	1980	1981	1982	1983
STEAM						
Eastern	27	16	-0-	71	-0-	8
Interior	3,306	3,628	2,677	2,539	2,436	2,440
Rocky Mtn.	5,311	7,826	7,966	8,072	8,526	9,023
Colorado	624	342	353	-0-	150	264
TOTAL	9,268	11,814	10,996	10,682	11,112	11,735
MET						
Eastern	-0-	-0-	-0-	-0-	-0-	-0-
Interior	-0-	-0-	-0-	-0-	-0-	-0-
Rocky Mtn.	-0-	-0-	-0-	-0-	-0-	-0-
Colorado	-0-	-0-	-0-	-0-	-0-	-0-
TOTAL	-0-	-0-	-0-	-0-	-0-	-0-
INDUSTRIAL						
Eastern	46	43	31	32	22	13
Interior	862	1,205	1,136	962	1,226	1,343
Rocky Mtn.	233	169	109	66	15	67
Colorado	188	257	173	146	135	9
TOTAL	1,329	1,674	1,449	1,206	1,398	1,432
RESIDENT/COM.						
Eastern	7	3	2	6	5	1
Interior	26	68	60	182	169	145
Rocky Mtn.	26	6	15	5	2	-0-
Colorado	2	7	13	4	-0-	3
TOTAL	61	84	90	197	176	149
TOTAL						
Eastern	80	62	33	109	27	22
Interior	4,194	4,901	3,873	3,683	3,831	3,928
Rocky Mtn.	5,570	8,001	8,090	8,143	8,543	9,090
Colorado	814	606	539	150	285	276
TOTAL	10,658	13,570	12,535	12,085	12,686	13,316

TABLE 3-13 ORIGIN OF COAL CONSUMED IN KANSAS
(In Thousands of Short Tons)

	1978	1979	1980	1981	1982	1983
STEAM						
Eastern	-0-	-0-	-0-	41	-0-	-0-
Interior	1,947	2,066	2,267	2,123	1,877	1,680
Rocky Mtn.	5,357	6,984	9,967	8,726	9,213	11,550
Colorado	91	363	265	276	1	-0-
TOTAL	7,395	9,413	12,499	11,166	11,091	13,230
MET						
Eastern	-0-	-0-	-0-	-0-	-0-	-0-
Interior	-0-	-0-	-0-	-0-	-0-	-0-
Rocky Mtn.	-0-	-0-	-0-	-0-	-0-	-0-
Colorado	-0-	-0-	-0-	-0-	-0-	-0-
TOTAL	-0-	-0-	-0-	-0-	-0-	-0-
INDUSTRIAL						
Eastern	-0-	-0-	10	-0-	-0-	-0-
Interior	98	206	321	303	337	205
Rocky Mtn.	-0-	-0-	-0-	-0-	-0-	-0-
Colorado	1	13	4	-0-	3	-0-
TOTAL	99	219	335	303	340	205
RESIDENT/COM.						
Eastern	-0-	-0-	-0-	-0-	4	-0-
Interior	3	8	5	2	7	1
Rocky Mtn.	-0-	-0-	-0-	-0-	-0-	-0-
Colorado	-0-	-0-	-0-	-0-	-0-	-0-
TOTAL	3	8	5	2	11	1
TOTAL						
Eastern	-0-	-0-	10	41	4	-0-
Interior	2,048	2,280	2,593	2,428	2,221	1,886
Rocky Mtn.	5,357	6,984	9,967	8,726	9,213	11,550
Colorado	92	376	269	276	4	-0-
TOTAL	7,497	9,640	12,839	11,471	11,442	13,436

TABLE 3-14 ORIGIN OF COAL CONSUMED IN NEBRASKA
(In Thousands of Short Tons)

	1978	1979	1980	1981	1982	1983
STEAM						
Eastern	-0-	-0-	-0-	-0-	-0-	-0-
Interior	58	3	-0-	-0-	5	3
Rocky Mtn.	2,559	4,094	4,535	4,913	5,859	5,452
Colorado	284	276	184	116	231	20
TOTAL	2,901	4,373	4,719	5,029	6,095	5,475
MET						
Eastern	-0-	-0-	-0-	-0-	-0-	-0-
Interior	-0-	-0-	-0-	-0-	-0-	-0-
Rocky Mtn.	-0-	-0-	-0-	-0-	-0-	-0-
Colorado	-0-	-0-	-0-	-0-	-0-	-0-
TOTAL	-0-	-0-	-0-	-0-	-0-	-0-
INDUSTRIAL						
Eastern	-0-	-0-	8	-0-	-0-	15
Interior	-0-	-0-	-0-	-0-	-0-	-0-
Rocky Mtn.	457	404	191	220	177	15
Colorado	97	136	92	85	93	31
TOTAL	554	540	291	305	270	61
RESIDENT/COM.						
Eastern	-0-	-0-	-0-	-0-	-0-	-0-
Interior	-0-	-0-	-0-	-0-	-0-	-0-
Rocky Mtn.	6	14	17	15	15	8
Colorado	-0-	2	2	1	12	48
TOTAL	6	16	19	16	27	56
TOTAL						
Eastern	-0-	-0-	8	-0-	-0-	15
Interior	58	3	-0-	-0-	5	3
Rocky Mtn.	3,022	4,512	4,743	5,148	6,051	5,475
Colorado	381	414	278	202	336	99
TOTAL	3,461	4,929	5,029	5,350	6,392	5,592

TABLE 3-15 ORIGIN OF COAL CONSUMED IN MINNESOTA
(In Thousands of Short Tons)

	1978	1979	1980	1981	1982	1983
STEAM						
Eastern	23	40	51	185	159	40
Interior	751	772	800	587	715	515
Rocky Mtn.	10,413	11,738	11,247	11,193	10,303	9,004
Colorado	11	-0-	-0-	-0-	-0-	-0-
TOTAL	11,198	12,550	12,098	11,965	11,177	9,559
MET						
Eastern	472	43	9	-0-	-0-	-0-
Interior	36	2	-0-	-0-	-0-	-0-
Rocky Mtn.	-0-	-0-	-0-	-0-	-0-	-0-
Colorado	-0-	-0-	-0-	-0-	-0-	-0-
TOTAL	508	45	9	-0-	-0-	-0-
INDUSTRIAL						
Eastern	302	452	268	255	169	104
Interior	163	161	95	182	83	89
Rocky Mtn.	977	931	663	733	803	523
Colorado	-0-	4	-0-	21	68	87
TOTAL	1,442	1,548	1,026	1,191	1,123	803
RESIDENT/COM.						
Eastern	22	6	64	13	16	17
Interior	4	10	5	9	5	17
Rocky Mtn.	25	63	73	109	141	115
Colorado	-0-	1	2	-0-	-0-	-0-
TOTAL	51	80	144	131	162	149
TOTAL						
Eastern	819	541	392	453	344	161
Interior	954	945	900	778	803	621
Rocky Mtn.	11,415	12,732	11,983	12,035	11,247	9,642
Colorado	11	5	2	21	68	87
TOTAL	13,199	14,223	13,277	13,287	12,462	10,511

TABLE 3-16 ORIGIN OF COAL CONSUMED IN MISSOURI
(In Thousands of Short Tons)

	1978	1979	1980	1981	1982	1983
STEAM						
Eastern	371	782	974	70	2	84
Interior	16,379	18,487	18,915	17,097	20,117	20,560
Rocky Mtn.	3,296	2,409	1,603	3,843	3,248	2,865
Colorado	474	773	744	500	161	-0-
TOTAL	20,520	22,451	22,236	21,510	23,528	23,509
MET						
Eastern	171	184	124	124	102	59
Interior	10	86	74	31	3	-0-
Rocky Mtn.	-0-	-0-	-0-	-0-	-0-	-0-
Colorado	-0-	-0-	-0-	-0-	-0-	-0-
TOTAL	181	270	198	155	105	59
INDUSTRIAL						
Eastern	123	36	74	46	64	53
Interior	1,372	1,516	1,337	1,307	1,237	1,135
Rocky Mtn.	29	-0-	-0-	-0-	-0-	-0-
Colorado	24	-0-	-0-	-0-	-0-	-0-
TOTAL	1,518	1,552	1,411	1,353	1,301	1,188
RESIDENT/COM.						
Eastern	-0-	-0-	10	1	-0-	7
Interior	63	83	72	105	88	125
Rocky Mtn.	-0-	-0-	-0-	1	-0-	-0-
Colorado	-0-	-0-	-0-	-0-	-0-	-0-
TOTAL	63	83	82	107	88	132
TOTAL						
Eastern	665	1,002	1,182	241	168	203
Interior	17,824	20,172	20,398	18,540	21,445	21,820
Rocky Mtn.	3,325	2,409	1,603	3,844	3,248	2,865
Colordo	498	773	744	500	161	-0-
TOTAL	22,312	24,356	23,927	23,125	25,022	24,888

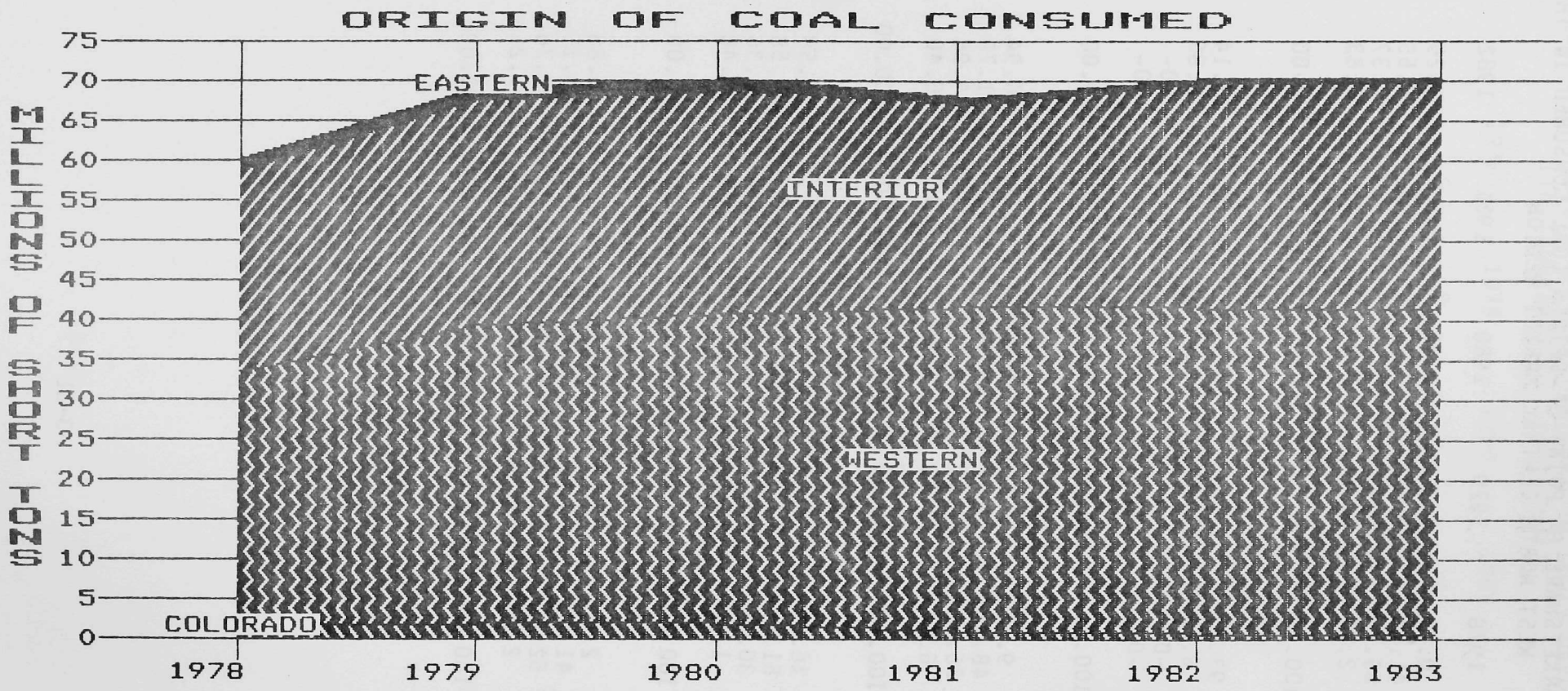
TABLE 3-17 ORIGIN OF COAL CONSUMED IN SOUTH DAKOTA
(In Thousands of Short Tons)

	1978	1979	1980	1981	1982	1983
STEAM						
Eastern	3	-0-	-0-	-0-	4	-0-
Interior	-0-	-0-	21	-0-	-0-	-0-
Rocky Mtn.	3,130	2,560	2,769	2,720	2,235	2,048
Colorado	-0-	-0-	6	-0-	-0-	-0-
TOTAL	3,133	2,560	2,796	2,720	2,239	2,048
MET						
Eastern	-0-	-0-	-0-	-0-	-0-	-0-
Interior	-0-	-0-	-0-	-0-	-0-	-0-
Rocky Mtn.	-0-	-0-	-0-	-0-	-0-	-0-
Colorado	-0-	-0-	-0-	-0-	-0-	-0-
TOTAL	-0-	-0-	-0-	-0-	-0-	-0-
INDUSTRIAL						
Eastern	1	-0-	28	33	70	-0-
Interior	-0-	-0-	-0-	-0-	7	-0-
Rocky Mtn.	166	56	96	132	174	200
Colorado	10	1	3	-0-	1	5
TOTAL	177	57	127	165	252	205
RESIDENT/COM.						
Eastern	1	-0-	1	2	2	1
Interior	-0-	-0-	-0-	-0-	-0-	-0-
Rocky Mtn.	-0-	1	15	47	18	3
Colorado	-0-	-0-	1	8	-0-	-0-
TOTAL	1	1	17	57	20	4
TOTAL						
Eastern	5	-0-	29	35	76	1
Interior	-0-	-0-	21	-0-	7	-0-
Rocky Mtn.	3,296	2,617	2,880	2,899	2,427	2,251
Colorado	10	1	10	8	1	5
TOTAL	3,311	2,618	2,940	2,942	2,511	2,257

TABLE 3-18 MARKETSHARE OF POINT-OF-ORIGIN COAL CONSUMED IN THE WEST NORTH CENTRAL MARKET REGION

	1978	1979	1980	1981	1982	1983
STEAM						
Eastern	0.78	1.33	1.57	0.58	0.25	0.20
Interior	41.24	39.51	37.77	35.42	38.55	38.44
Rocky Mtn.	55.25	56.38	58.29	62.57	60.37	60.93
Colorado	2.73	2.78	2.38	1.41	0.83	0.43
TOTAL	100.00	100.00	100.00	100.00	100.00	100.00
MET						
Eastern	93.32	72.06	64.25	80.00	97.14	100.00
Interior	6.68	27.94	35.75	20.00	2.86	-0-
Rocky Mtn.	-0-	-0-	-0-	-0-	-0-	-0-
Colorado	-0-	-0-	-0-	-0-	-0-	-0-
TOTAL	100.00	100.00	100.00	100.00	100.00	100.00
INDUSTRIAL						
Eastern	9.17	9.50	9.03	8.67	6.94	4.75
Interior	48.46	55.24	62.28	58.08	61.70	71.19
Rocky Mtn.	36.16	27.91	22.83	27.27	24.96	20.67
Colorado	6.21	7.35	5.86	5.97	6.40	3.39
TOTAL	100.00	100.00	100.00	100.00	100.00	100.00
RESIDENT/COM.						
Eastern	16.22	3.31	21.57	4.31	5.58	5.30
Interior	51.89	62.13	39.78	58.43	55.58	58.66
Rocky Mtn.	30.81	30.88	33.61	34.71	36.36	25.66
Colorado	1.08	3.68	5.04	2.55	2.48	10.39
TOTAL	100.00	100.00	100.00	100.00	100.00	100.00
TOTAL						
Eastern	2.60	2.31	2.34	1.29	0.88	0.57
Interior	41.49	40.82	39.39	36.97	40.15	40.37
Rocky Mtn.	52.92	53.73	55.66	60.03	57.76	58.39
Colorado	2.99	3.14	2.61	1.70	1.21	0.67
TOTAL	100.00	100.00	100.00	100.00	100.00	100.00

FIGURE 3-3 ORIGIN OF COAL CONSUMED IN WEST NORTH CENTRAL MARKET REGION



3.3.3 East and West South Central Market Region

The East and West South Central Market Region consists of two states, Texas and Mississippi. These states are presently the only Gulf Coast markets for Colorado coal. Table 3-19 combines coal consumption data for Texas and Mississippi. Tables 3-20 and 3-21 list coal consumption trends for Texas and Mississippi, respectively.

Population growth and conversion of generating plants from natural gas to coal are prompting the rise in coal consumption in this region. Steam coal consumption has increased 144 percent since 1978. Most of the increase is due to the Texas market.

Texas is also host to an historical met coal market which suffered sharp declines and was nonexistent in 1983. Industrial coal consumption peaked in 1981 and is trailing off at a volume of 4.2 mtpy in 1983. Due to the mild climate and availability of more convenient substitutes, residential coal use is insignificant.

Table 3-22 lists the trends of coal origin destined for the East and West South Central Market Region. This market is growing and new coal requirements are being met by Rocky Mountain producers including Colorado. Since 1978 coal produced by the Interior Coal Province declined in significance from 73 percent of market to 55 percent in 1983. Along with the preference of western coals, Colorado increased its share of the market from 0.97 percent in 1978 to 5.45 percent in 1983. Figure 3-4 displays these data.

TABLE 3-19 ORIGIN OF COAL CONSUMED IN EAST AND WEST SOUTH CENTRAL MARKET REGION
(In Thousands of Short Tons)

	1978	1979	1980	1981	1982	1983
STEAM						
Eastern	360	557	748	802	863	1,104
Interior	20,847	26,278	30,604	31,358	33,591	37,364
Rocky Mtn.	6,929	11,860	18,132	22,939	23,153	27,775
Colorado	262	735	1,730	2,570	2,833	3,012
TOTAL	28,398	39,430	51,214	57,669	60,440	69,255
MET						
Eastern	117	463	284	11	-0-	-0-
Interior	226	449	366	409	255	-0-
Rocky Mtn.	-0-	-0-	-0-	-0-	-0-	-0-
Colorado	31	210	190	173	145	-0-
TOTAL	374	1,122	840	593	400	-0-
INDUSTRIAL						
Eastern	9	9	124	90	108	22
Interior	1,415	2,827	1,721	3,806	3,254	3,213
Rocky Mtn.	349	474	12	79	20	1
Colorado	3	109	603	692	917	995
TOTAL	1,776	3,419	2,460	4,667	4,299	4,231
RESIDENT/COM.						
Eastern	1	-0-	-0-	5	-0-	-0-
Interior	-0-	-0-	-0-	-0-	-0-	-0-
Rocky Mtn.	-0-	-0-	1	-0-	5	-0-
Colorado	-0-	-0-	-0-	-0-	-0-	-0-
TOTAL	1	-0-	1	5	5	-0-
TOTAL						
Eastern	487	1,029	1,156	908	971	1,146
Interior	22,488	29,554	32,691	35,573	37,100	40,577
Rocky Mtn.	7,278	12,334	18,145	23,018	23,178	27,776
Colorado	296	1,054	2,523	3,435	3,895	4,007
TOTAL	30,549	43,971	54,515	62,934	65,144	73,506

TABLE 3-20 ORIGIN OF COAL CONSUMED IN TEXAS
(In Thousands of Short Tons)

	1978	1979	1980	1981	1982	1983
STEAM						
Eastern	-0-	15	28	-0-	-0-	-0-
Interior	19,740	24,951	28,909	30,318	32,250	36,291
Rocky Mtn.	6,920	11,600	17,727	22,355	22,366	27,027
Colorado	6	38	982	1,795	2,048	2,051
TOTAL	26,666	36,604	47,646	54,468	56,664	65,389
MET						
Eastern	117	463	284	11	-0-	-0-
Interior	226	449	366	409	255	-0-
Rocky Mtn.	-0-	-0-	-0-	-0-	-0-	-0-
Colorado	31	210	190	173	145	-0-
TOTAL	374	1,122	840	593	400	-0-
INDUSTRIAL						
Eastern	2	9	124	83	82	1
Interior	1,352	2,770	1,667	3,702	3,191	3,080
Rocky Mtn.	349	474	12	79	20	1
Colorado	3	109	603	692	917	995
TOTAL	1,706	3,362	2,406	4,556	4,210	4,077
RESIDENT/COM.						
Eastern	-0-	-0-	-0-	5	-0-	-0-
Interior	-0-	-0-	-0-	-0-	-0-	-0-
Rocky Mtn.	-0-	-0-	1	-0-	5	-0-
Colorado	-0-	-0-	-0-	-0-	-0-	-0-
TOTAL	-0-	-0-	1	5	5	-0-
TOTAL						
Eastern	119	487	436	99	82	21
Interior	21,318	28,170	30,942	34,429	35,696	39,371
Rocky Mtn.	7,269	12,074	17,740	22,434	22,391	27,028
Colorado	40	357	1,775	2,660	3,110	3,046
TOTAL	28,746	41,088	50,893	59,622	61,279	69,466

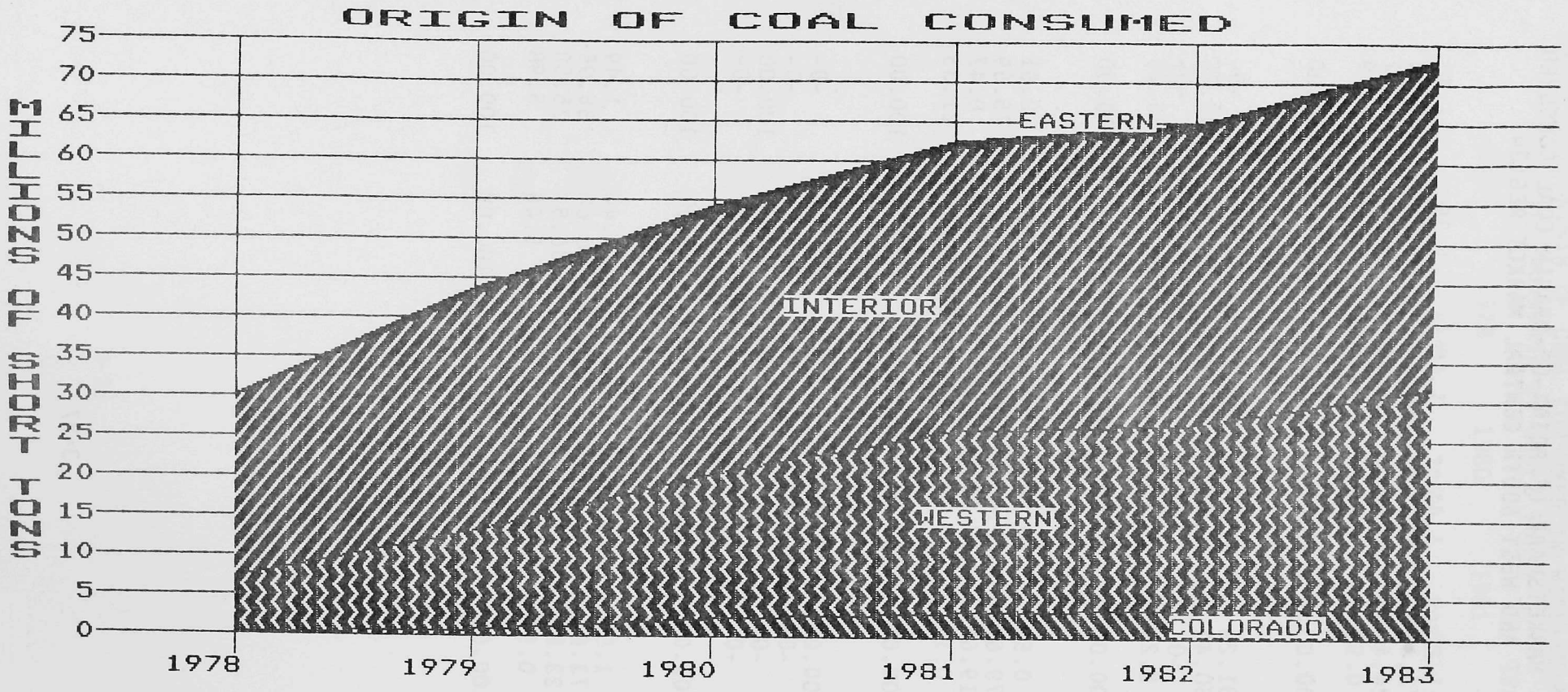
TABLE 3-21 ORIGIN OF COAL CONSUMED IN MISSISSIPPI
(In Thousands of Short Tons)

	1978	1979	1980	1981	1982	1983
STEAM						
Eastern	360	542	720	802	803	1,104
Interior	1,107	1,327	1,695	1,040	1,341	1,073
Rocky Mtn.	9	260	405	584	787	748
Colorado	256	697	748	775	785	961
TOTAL	1,732	2,826	3,568	3,201	3,776	3,886
MET						
Eastern	-0-	-0-	-0-	-0-	-0-	-0-
Interior	-0-	-0-	-0-	-0-	-0-	-0-
Rocky Mt.	-0-	-0-	-0-	-0-	-0-	-0-
Colorado	-0-	-0-	-0-	-0-	-0-	-0-
TOTAL	-0-	-0-	-0-	-0-	-0-	-0-
INDUSTRIAL						
Eastern	7	-0-	-0-	7	26	21
	63	57	54	104	63	133
Rocky Mtn.	-0-	-0-	-0-	-0-	-0-	-0-
Colorado	-0-	-0-	-0-	-0-	-0-	-0-
TOTAL	70	57	54	111	89	154
RESIDENT/COM.						
Eastern	1	-0-	-0-	-0-	-0-	-0-
Interior	-0-	-0-	1	-0-	-0-	3
Rocky Mtn.	-0-	-0-	-0-	-0-	-0-	-0-
Colorado	-0-	-0-	-0-	-0-	-0-	-0-
TOTAL	1	-0-	1	-0-	-0-	3
TOTAL						
Eastern	368	542	720	809	889	1,125
Interior	1,170	1,384	1,750	1,144	1,404	1,209
Rocky Mtn.	9	260	405	584	787	748
Colorado	256	697	748	775	785	961
TOTAL	1,803	2,883	3,623	3,312	3,865	4,043

TABLE 3-22 MARKETSHARE OF POINT-OF-ORIGIN COAL CONSUMED IN EAST AND WEST SOUTH CENTRAL MARKET REGION

STEAM						
Eastern	1.27	1.41	1.46	1.39	1.43	1.59
Interior	73.41	66.64	59.76	54.38	55.58	53.95
Rocky Mtn.	24.40	30.08	35.40	39.78	38.31	40.11
Colorado	0.92	1.86	3.38	4.46	4.69	4.35
TOTAL	100.00	100.00	100.00	100.00	100.00	100.00
MET						
Eastern	31.28	41.27	33.81	1.85	-0-	-0-
Interior	60.43	40.02	43.57	68.97	63.75	-0-
Rocky Mtn.	-0-	-0-	-0-	-0-	-0-	-0-
Colorado	8.29	18.72	22.62	29.17	36.25	-0-
TOTAL	100.00	100.00	100.00	100.00	100.00	100.00
INDUSTRIAL						
Eastern	0.51	0.26	5.04	1.93	2.51	0.52
Interior	79.67	82.68	69.96	81.55	75.69	75.94
Rocky Mtn.	19.65	13.86	0.49	1.69	0.47	0.02
Colorado	0.17	3.19	24.51	14.83	21.33	23.52
TOTAL	100.00	100.00	100.00	100.00	100.00	100.00
RESIDENT/COM.						
Eastern	100.00	-0-	-0-	100.00	-0-	-0-
Interior	-0-	-0-	-0-	-0-	-0-	-0-
Rocky Mtn.	-0-	-0-	100.00	-0-	100.00	-0-
Colorado	-0-	-0-	-0-	-0-	-0-	-0-
TOTAL	100.00	100.00	100.00	100.00	100.00	100.00
TOTAL						
Eastern	1.59	2.34	2.12	1.44	1.49	1.56
Interior	73.61	67.21	59.97	56.62	56.95	55.20
Rocky Mtn.	23.82	28.05	33.28	36.57	35.58	37.79
Colorado	0.97	2.40	4.63	5.46	5.98	5.45
TOTAL	100.00	100.00	100.00	100.00	100.00	100.00

FIGURE 3-4 ORIGIN OF COAL CONSUMED IN EAST AND WEST SOUTH CENTRAL MARKET REGION



3.3.4 Mountain Market Region

Table 3-23 lists the aggregate coal consumption and point of origin for states in the Mountain Market Region. Tables 3-24, 3-25, 3-26, 3-27, 3-28 and 3-29 list state consumption trends for Arizona, Colorado Montana, New Mexico, Utah and Wyoming, respectively.

Coal consumption peaked in 1982 in all coal products except met coal. Wyoming is the largest steam coal consumer in the region and burns only its own coal for raising steam. Arizona and New Mexico are large steam coal product consumers as well, and these states produce and consume mainly their own coal.

Utah is currently the only market for met coal and will be served by Colorado. Residential/commercial use of coal is quite variable, generally in decline and not a major market.

Table 3-30 lists the marketshare of point-of-origin coal serving the Mountain Market Region. Entrenched in coal fields, all states in the Mountain Market Region have active coal production and developed markets. The Mountain Market Region takes over 99 percent of its coal needs from states within the region. The contribution of Colorado coal has declined since 1979. Figure 3-5 shows data pertaining to point-of-origin of Colorado coal. Figure 3-6 shows this relationship for the Mountain Market Region in terms of production.

TABLE 3-23 ORIGIN OF COAL CONSUMED IN MOUNTAIN MARKET REGION
(In Thousands of Short Tons)

	1978	1979	1980	1981	1982	1983
STEAM						
Eastern	-0-	-0-	-0-	-0-	26	-0-
Interior	-0-	-0-	-0-	-0-	-0-	-0-
Rocky Mtn.	37,330	44,609	51,893	53,318	56,114	51,943
Colorado	6,022	8,533	8,413	8,277	8,175	7,607
TOTAL	43,352	53,142	60,306	61,595	64,315	59,550
MET						
Eastern	8	-0-	-0-	106	-0-	-0-
Interior	-0-	206	124	210	67	-0-
Rocky Mtn.	352	324	318	267	137	33
Colorado	1,865	2,124	1,910	1,762	987	825
TOTAL	2,225	2,654	2,352	2,345	1,191	858
INDUSTRIAL						
Eastern	17	-0-	2	-0-	8	3
Interior	122	-0-	84	2	2	-0-
Rocky Mtn.	3,065	4,664	2,884	3,564	3,774	2,945
Colorado	444	601	816	909	906	1,097
TOTAL	3,648	5,265	3,786	4,475	4,690	4,045
RESIDENT/COM.						
Eastern	-0-	-0-	-0-	-0-	-0-	4
Interior	41	-0-	-0-	-0-	-0-	-0-
Rocky Mtn.	159	187	404	333	351	271
Colorado	28	55	96	82	124	56
TOTAL	228	242	500	415	475	331
TOTAL						
Eastern	25	-0-	2	106	34	7
Interior	163	206	208	212	69	0
Rocky Mtn.	40,906	49,784	55,499	57,482	60,376	55,192
Colorado	8,359	11,313	11,235	11,030	10,192	9,585
TOTAL	49,453	61,303	66,944	68,830	70,671	64,784

TABLE 3-24 ORIGIN OF COAL CONSUMED IN ARIZONA
(In Thousands of Short Tons)

	1978	1979	1980	1981	1982	1983
STEAM						
Eastern	-0-	-0-	-0-	-0-	-0-	-0-
Interior	-0-	-0-	-0-	-0-	-0-	-0-
Rocky Mtn.	7,702	10,993	12,510	12,930	12,632	11,317
Colorado	8	-0-	-0-	-0-	-0-	-0-
TOTAL	7,710	10,993	12,510	12,930	12,632	11,317
MET						
Eastern	-0-	-0-	-0-	-0-	-0-	-0-
Interior	-0-	-0-	-0-	-0-	-0-	-0-
Rocky Mtn.	-0-	-0-	-0-	-0-	-0-	-0-
Colorado	-0-	-0-	-0-	-0-	-0-	-0-
TOTAL	-0-	-0-	-0-	-0-	-0-	-0-
INDUSTRIAL						
Eastern	-0-	-0-	-0-	-0-	-0-	-0-
Interior	-0-	-0-	-0-	-0-	-0-	-0-
Rocky Mtn.	433	1,884	579	1,024	1,295	1,217
Colorado	-0-	-0-	76	153	213	177
TOTAL	433	1,884	655	1,177	1,508	1,394
RESIDENT/COM						
Eastern	-0-	-0-	-0-	-0-	-0-	-0-
Interior	-0-	-0-	-0-	-0-	-0-	-0-
Rocky Mtn.	-0-	-0-	-0-	-0-	-0-	-0-
Colorado	-0-	-0-	-0-	-0-	-0-	-0-
TOTAL	-0-	-0-	-0-	-0-	-0-	-0-
TOTAL						
Eastern	-0-	-0-	-0-	-0-	-0-	-0-
Interior	-0-	-0-	-0-	-0-	-0-	-0-
Rocky Mtn.	8,135	12,877	12,574	13,954	13,927	12,534
Colorado	8	-0-	-0-	153	213	177
TOTAL	8,143	12,877	12,574	14,107	14,140	12,711

TABLE 3-25 ORIGIN OF COAL CONSUMED IN COLORADO
(In Thousands of Short Tons)

	1978	1979	1980	1981	1982	1983
STEAM						
Eastern	-0-	-0-	-0-	-0-	-0-	-0-
Interior	-0-	-0-	-0-	-0-	-0-	-0-
Rocky Mtn.	3,094	3,051	3,178	3,323	3,948	4,495
Colorado	6,014	8,526	8,405	8,269	8,154	7,607
TOTAL	9,108	11,577	11,583	11,592	12,102	12,102
MET						
Eastern	8	-0-	-0-	19	-0-	-0-
Interior	-0-	206	124	210	67	-0-
Rocky Mtn.	-0-	-0-	-0-	-0-	-0-	-0-
Colorado	641	880	764	732	292	-0-
TOTAL	649	1,086	888	961	359	-0-
INDUSTRIAL						
Eastern	17	-0-	2	-0-	-0-	-0-
Interior	121	-0-	84	2	-0-	-0-
Rocky Mtn.	75	45	58	31	54	4
Colorado	431	487	708	619	529	657
TOTAL	644	532	852	652	583	661
RESIDENT/COM.						
Eastern	-0-	-0-	-0-	-0-	-0-	-0-
Interior	41	-0-	-0-	-0-	-0-	-0-
Rocky Mtn.	26	4	5	12	9	9
Colorado	28	54	94	82	120	56
TOTAL	95	58	99	94	129	65
TOTAL						
Eastern	25	-0-	2	19	-0-	-0-
Interior	162	206	208	212	67	-0-
Rocky Mtn.	3,195	3,100	3,241	3,366	4,011	4,508
Colorado	7,114	9,947	9,971	9,702	9,095	8,320
TOTAL	10,496	13,253	13,422	13,299	13,173	12,828

TABLE 3-26 ORIGIN OF COAL CONSUMED IN MONTANA
(In Thousands of Short Tons)

	1978	1979	1980	1981	1982	1983
STEAM						
Eastern	-0-	-0-	-0-	-0-	-0-	-0-
Interior	-0-	-0-	-0-	-0-	-0-	-0-
Rocky Mtn.	3,334	3,513	3,462	3,318	2,616	2,244
Colorado	-0-	-0-	-0-	-0-	3	-0-
TOTAL	3,334	3,513	3,462	3,318	2,619	2,244
MET						
Eastern	-0-	-0-	-0-	-0-	-0-	-0-
Interior	-0-	-0-	-0-	-0-	-0-	-0-
Rocky Mtn.	-0-	-0-	-0-	-0-	-0-	-0-
Colorado	-0-	-0-	-0-	-0-	-0-	-0-
TOTAL	-0-	-0-	-0-	-0-	-0-	-0-
INDUSTRIAL						
Eastern	-0-	-0-	-0-	-0-	-0-	3
Interior	-0-	-0-	-0-	-0-	2	-0-
Rocky Mtn.	171	183	160	232	186	119
Colorado	12	31	23	21	9	4
TOTAL	183	214	183	253	197	126
RESIDENT/COM.						
Eastern	-0-	-0-	-0-	-0-	-0-	4
Interior	-0-	-0-	-0-	-0-	-0-	-0-
Rocky Mtn.	4	3	13	7	9	3
Colorado	-0-	-0-	-0-	-0-	-0-	-0-
TOTAL	4	3	13	7	9	7
TOTAL						
Eastern	-0-	-0-	-0-	-0-	-0-	7
Interior	-0-	-0-	-0-	-0-	2	-0-
Rocky Mtn.	3,509	3,699	3,035	3,557	2,811	2,366
Colorado	12	31	23	21	12	4
TOTAL	3,521	3,730	3,658	3,578	2,825	2,377

TABLE 3-27 ORIGIN OF COAL CONSUMED IN NEW MEXICO
(In Thousands of Short Tons)

	1978	1979	1980	1981	1982	1983
STEAM						
Eastern	-0-	-0-	-0-	-0-	26	-0-
Interior	-0-	-0-	-0-	-0-	-0-	-0-
Rocky Mtn.	8,753	8,602	10,972	11,306	12,335	14,001
Colorado	-0-	7	8	-0-	-0-	-0-
TOTAL	8,753	8,609	10,980	11,306	12,361	14,001
MET						
Eastern	-0-	-0-	-0-	-0-	-0-	-0-
Interior	-0-	-0-	-0-	-0-	-0-	-0-
Rocky Mtn.	-0-	-0-	-0-	-0-	-0-	-0-
Colorado	-0-	-0-	-0-	-0-	-0-	-0-
TOTAL	-0-	-0-	-0-	-0-	-0-	-0-
INDUSTRIAL						
Eastern	-0-	-0-	-0-	-0-	8	-0-
Interior	-0-	-0-	-0-	-0-	-0-	-0-
Rocky Mtn.	80	12	-0-	100	104	-0-
Colorado	-0-	81	7	15	15	95
TOTAL	80	93	7	115	127	95
RESIDENT/COM.						
Eastern	-0-	-0-	-0-	-0-	-0-	-0-
Interior	-0-	-0-	-0-	-0-	-0-	-0-
Rocky Mtn.	-0-	1	43	5	12	8
Colorado	-0-	-0-	2	-0-	1	-0-
TOTAL	-0-	1	45	5	13	8
TOTAL						
Eastern	-0-	-0-	-0-	-0-	34	-0-
Interior	-0-	-0-	-0-	-0-	-0-	-0-
Rocky Mtn.	8,833	8,615	11,015	11,411	12,451	14,009
Colorado	-0-	88	17	15	16	95
TOTAL	8,833	8,703	11,032	11,426	12,501	14,104

TABLE 3-28 ORIGIN OF COAL CONSUMED IN UTAH
(In Thousands of Short Tons)

	1978	1979	1980	1981	1982	1983
STEAM						
Eastern	-0-	-0-	-0-	-0-	-0-	-0-
Interior	-0-	-0-	-0-	-0-	-0-	-0-
Rocky Mtn.	2,896	4,239	5,224	4,829	6,135	5,155
Colorado	-0-	-0-	-0-	8	18	-0-
TOTAL	2,896	4,239	5,224	4,837	6,153	5,155
MET						
Eastern	-0-	-0-	-0-	87	-0-	-0-
Interior	-0-	-0-	-0-	-0-	-0-	-0-
Rocky Mtn.	352	324	318	267	137	33
Colorado	1,224	1,244	1,146	1,030	695	825
TOTAL	1,576	1,568	1,464	1,384	832	858
INDUSTRIAL						
Eastern	-0-	-0-	-0-	-0-	-0-	-0-
Interior	-0-	-0-	-0-	-0-	-0-	-0-
Rocky Mtn.	795	843	425	567	798	673
Colorado	-0-	2	2	24	15	24
TOTAL	795	845	427	591	813	697
RESIDENT/COM.						
Eastern	-0-	-0-	-0-	-0-	-0-	-0-
Interior	-0-	-0-	-0-	-0-	-0-	-0-
Rocky Mtn.	71	144	238	196	177	147
Colorado	-0-	1	-0-	-0-	-0-	-0-
TOTAL	71	145	238	196	177	147
TOTAL						
Eastern	-0-	-0-	-0-	87	-0-	-0-
Interior	-0-	-0-	-0-	-0-	-0-	-0-
Rocky Mtn.	4,114	5,550	6,205	5,859	7,247	6,008
Colorado	1,224	1,247	1,148	1,062	728	849
TOTAL	5,338	6,797	7,353	7,008	7,975	6,857

TABLE 3-29 ORIGIN OF COAL CONSUMED IN WYOMING
(In Thousands of Short Tons)

	1978	1979	1980	1981	1982	1983
STEAM						
Eastern	-0-	-0-	-0-	-0-	-0-	-0-
Interior	-0-	-0-	-0-	-0-	-0-	-0-
Rocky Mtn.	11,551	14,211	16,547	17,612	18,448	14,731
Colorado	-0-	-0-	-0-	-0-	-0-	-0-
TOTAL	11,551	14,211	16,547	17,612	18,448	14,731
MET						
Eastern	-0-	-0-	-0-	-0-	-0-	-0-
Interior	-0-	-0-	-0-	-0-	-0-	-0-
Rocky Mtn.	-0-	-0-	-0-	-0-	-0-	-0-
Colorado	-0-	-0-	-0-	-0-	-0-	-0-
TOTAL	-0-	-0-	-0-	-0-	-0-	-0-
INDUSTRIAL						
Eastern	-0-	-0-	-0-	-0-	-0-	-0-
Interior	1	-0-	-0-	-0-	-0-	-0-
Rocky Mtn.	1,511	1,697	1,662	1,610	1,337	1,532
Colorado	1	-0-	-0-	77	125	140
TOTAL	1,513	1,697	1,662	1,687	1,462	1,672
RESIDENT/COM.						
Eastern	-0-	-0-	-0-	-0-	-0-	-0-
Interior	-0-	-0-	-0-	-0-	-0-	-0-
Rocky Mtn.	58	35	105	113	144	104
Colorado	-0-	-0-	-0-	-0-	3	-0-
TOTAL	58	35	105	113	147	104
TOTAL						
Eastern	-0-	-0-	-0-	-0-	-0-	-0-
Interior	1	-0-	-0-	-0-	-0-	-0-
Rocky Mtn.	13,120	15,943	18,314	19,335	19,929	16,367
Colorado	1	-0-	-0-	77	128	140
TOTAL	13,122	15,943	18,314	19,412	20,057	16,507

TABLE 3-30 MARKETSHARE OF POINT-OF-ORIGIN COAL CONSUMED IN MOUNTAIN MARKET REGION

	1978	1979	1980	1981	1982	1983
STEAM						
Eastern	-0-	-0-	-0-	-0-	0.04	-0-
Interior	-0-	-0-	-0-	-0-	-0-	-0-
Rocky Mtn.	86.11	83.94	86.05	86.56	87.25	87.23
Colorado	13.89	16.06	13.95	13.44	12.71	12.77
TOTAL	100.00	100.00	100.00	100.00	100.00	100.00
MET						
Eastern	0.36	-0-	-0-	4.52	-0-	-0-
Interior	-0-	7.76	5.27	8.96	5.63	-0-
Rocky Mtn.	15.82	12.21	13.52	11.39	11.50	3.85
Colorado	83.82	80.03	81.21	75.14	82.87	96.15
TOTAL	100.00	100.00	100.00	100.00	100.00	100.00
INDUSTRIAL						
Eastern	0.47	-0-	0.05	-0-	0.17	0.08
Interior	3.34	-0-	2.22	0.04	0.04	-0-
Rocky Mtn.	84.02	88.58	76.18	79.64	80.47	73.72
Colorado	12.17	11.42	21.55	20.31	19.32	26.21
TOTAL	100.00	100.00	100.00	100.00	100.00	100.00
RESIDENT/COM.						
Eastern	-0-	-0-	-0-	-0-	-0-	1.21
Interior	17.98	-0-	-0-	-0-	-0-	-0-
Rocky Mtn.	69.74	77.27	80.80	80.24	73.89	81.87
Colorado	12.28	22.73	19.20	19.76	26.11	16.92
TOTAL	100.00	100.00	100.00	100.00	100.00	100.00
TOTAL						
Eastern	0.05	-0-	nil	0.15	0.05	0.01
Interior	0.33	0.34	0.31	0.31	0.10	-0-
Rocky Mtn.	82.72	81.21	82.90	83.51	85.43	85.19
Colorado	16.90	18.45	16.78	16.02	14.42	14.80
TOTAL	100.00	100.00	100.00	100.00	100.00	100.00

FIGURE 3-5 ORIGIN OF COAL CONSUMED IN COLORADO

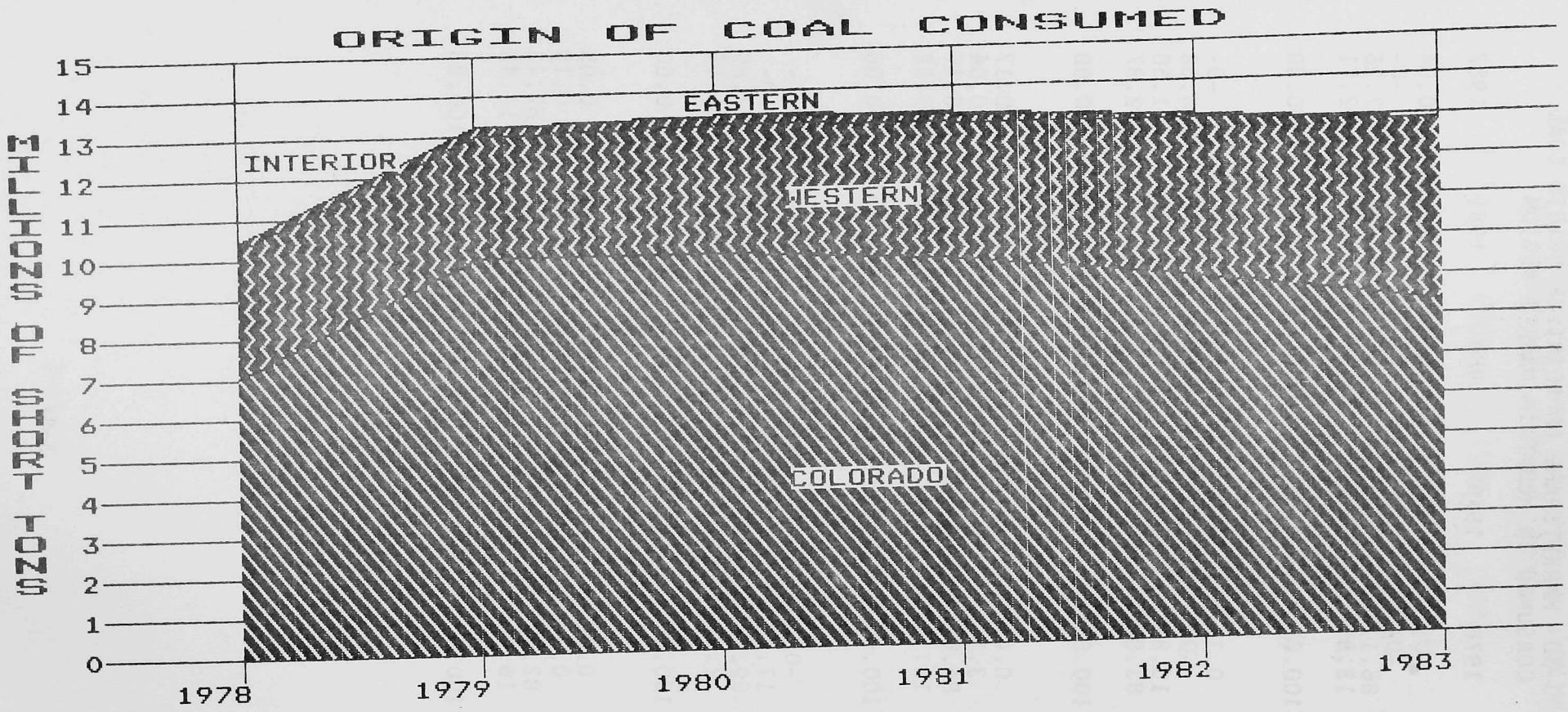
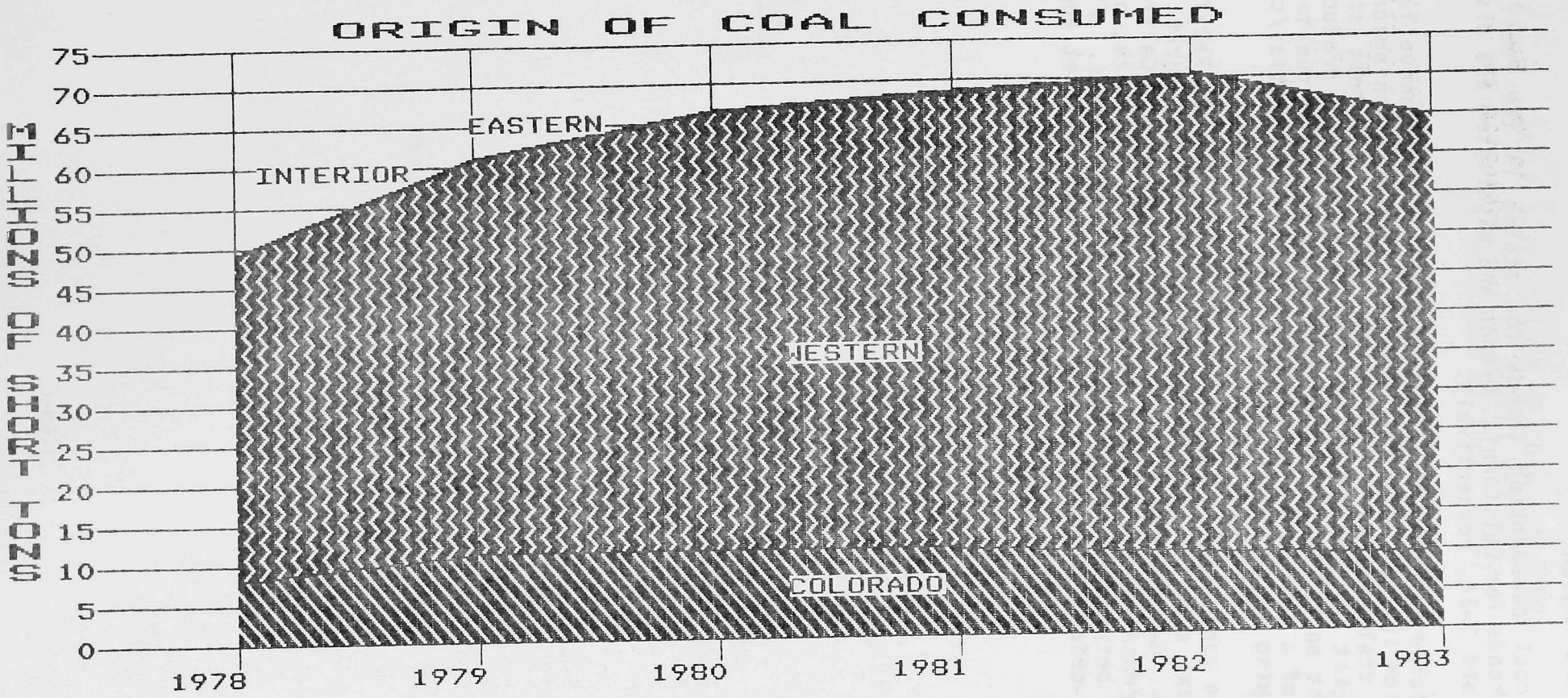


FIGURE 3-6 ORIGIN OF COAL CONSUMED IN MOUNTAIN MARKET REGION



3.3.5 Pacific Market Region

Table 3-31 shows coal consumption trends for states in the Pacific Market Region. Coal use trends for California, Oregon and Washington are displayed in Tables 3-32, 3-33 and 3-34, respectively.

Coal consumption peaked in 1980 and is quite variable. On an annualized basis, 1983 coal consumption is down 39 percent from 1982 levels. Washington state is the largest steam coal consumer. California retains the most significant industrial coal market and, until 1983, a significant met coal product market. A steam coal product market in California opened in the first quarter of 1984 with requirements of a cool water gasification plant. Residential/commercial use of coal is growing in Washington state.

Table 3-35 lists the marketshare of point-of-origin coal for the Pacific Market Region. Western coal supplies over 98 percent of the Pacific Market Region's domestic coal needs. Colorado supplied 10 to 44 percent of the California met coal product requirement up until 1982. Rocky Mountain producers, other than Colorado, provided between 90 and 96 percent of all coal needs. Figure 3-7 shows the point-of-origin of coal consumed in the Pacific Market Region.

TABLE 3-31 ORIGIN OF COAL CONSUMED
IN PACIFIC MARKET REGION
(In Thousands of Short Tons)

	1978	1979	1980	1981	1982	1983
STEAM						
Eastern	-0-	-0-	-0-	16	427	-0-
Interior	-0-	-0-	-0-	-0-	-0-	-0-
Rocky Mtn.	4,804	5,063	6,231	5,791	5,296	3,778
Colorado	-0-	-0-	-0-	-0-	-0-	-0-
TOTAL	4,804	5,063	6,231	5,807	5,723	3,778
MET						
Eastern	1	-0-	-0-	-0-	-0-	-0-
Interior	-0-	-0-	-0-	-0-	-0-	-0-
Rocky Mtn.	1,162	922	1,199	1,161	1,262	-0-
Colorado	280	726	531	206	141	-0-
TOTAL	1,443	1,648	1,730	1,367	1,403	-0-
INDUSTRIAL						
Eastern	20	13	19	73	3	9
Interior	14	33	33	20	35	32
Rocky Mtn.	1,838	1,828	1,904	2,224	1,876	1,424
Colorado	8	13	14	34	20	150
TOTAL	1,880	1,887	1,970	2,351	1,934	1,615
RESIDENT/COM.						
Eastern	-0-	-0-	-0-	17	-0-	-0-
Interior	-0-	-0-	11	-0-	-0-	-0-
Rocky Mtn.	53	41	164	109	174	245
Colorado	-0-	-0-	-0-	1	-0-	-0-
TOTAL	53	41	175	127	174	245
TOTAL						
Eastern	21	13	19	106	430	9
Interior	14	33	44	20	35	32
Rocky Mtn.	7,857	7,854	9,498	9,285	8,608	5,447
Colorado	288	739	545	241	161	150
TOTAL	8,180	8,639	10,106	9,652	9,234	5,638

TABLE 3-32 ORIGIN OF COAL CONSUMED IN CALIFORNIA
(In Thousands of Short Tons)

	1978	1979	1980	1981	1982	1983
STEAM						
Eastern	-0-	-0-	-0-	-0-	-0-	-0-
Interior	-0-	-0-	-0-	-0-	-0-	-0-
Rocky Mtn.	-0-	-0-	-0-	-0-	-0-	-0-
Colorado	-0-	-0-	-0-	-0-	-0-	-0-
TOTAL	-0-	-0-	-0-	-0-	-0-	-0-
MET						
Eastern	1	-0-	-0-	-0-	-0-	-0-
Interior	-0-	-0-	-0-	-0-	-0-	-0-
Rocky Mtn.	1,162	922	1,199	1,161	1,262	-0-
Colorado	280	726	531	206	141	-0-
TOTAL	1,443	1,648	1,730	1,367	1,403	-0-
INDUSTRIAL						
Eastern	2	2	2	3	-0-	-0-
Interior	-0-	-0-	2	-0-	1	7
Rocky Mtn.	1,125	1,081	1,390	1,693	1,420	1,148
Colorado	-0-	-0-	-0-	-0-	-0-	143
TOTAL	1,127	1,083	1,394	1,696	1,421	1,298
RESIDENT/COM.						
Eastern	-0-	-0-	-0-	-0-	-0-	-0-
Interior	-0-	-0-	-0-	-0-	-0-	-0-
Rocky Mtn.	1	-0-	4	2	2	2
Colorado	-0-	-0-	-0-	-0-	-0-	-0-
TOTAL	1	-0-	4	2	2	2
TOTAL						
Eastern	3	2	2	3	-0-	-0-
Interior	-0-	-0-	2	-0-	1	7
Rocky Mtn.	2,287	2,003	2,593	2,856	2,684	1,150
Colorado	280	726	531	206	141	143
TOTAL	2,571	2,731	3,128	3,065	2,826	1,300

TABLE 3-33 ORIGIN OF COAL CONSUMED IN OREGON
(In Thousands of Short Tons)

	1978	1979	1980	1981	1982	1983
STEAM						
Eastern	-0-	-0-	-0-	14	52	-0-
Interior	-0-	-0-	-0-	-0-	-0-	-0-
Rocky Mtn.	49	-0-	1,091	1,156	1,135	-0-
Colorado	-0-	-0-	-0-	-0-	-0-	-0-
TOTAL	49	-0-	1,091	1,170	1,187	-0-
MET						
Eastern	-0-	-0-	-0-	-0-	-0-	-0-
Interior	-0-	-0-	-0-	-0-	-0-	-0-
Rocky Mtn.	-0-	-0-	-0-	-0-	-0-	-0-
Colorado	-0-	-0-	-0-	-0-	-0-	-0-
TOTAL	-0-	-0-	-0-	-0-	-0-	-0-
INDUSTRIAL						
Eastern	-0-	-0-	-0-	58	-0-	4
Interior	11	8	-0-	-0-	9	5
Rocky Mtn.	209	227	222	257	150	99
Colorado	3	2	4	2	-0-	7
TOTAL	223	237	226	317	159	115
RESIDENT/COM.						
Eastern	-0-	-0-	-0-	1	-0-	-0-
Interior	-0-	-0-	-0-	-0-	-0-	-0-
Rocky Mtn.	6	6	11	3	5	3
Colorado	-0-	-0-	-0-	-0-	-0-	-0-
TOTAL	6	6	11	4	5	3
TOTAL						
Eastern	-0-	-0-	-0-	73	52	4
Interior	11	8	-0-	-0-	9	5
Rocky Mtn.	264	233	1,324	1,416	1,290	102
Colorado	3	2	4	-0-	-0-	7
TOTAL	278	243	1,328	1,489	1,351	118

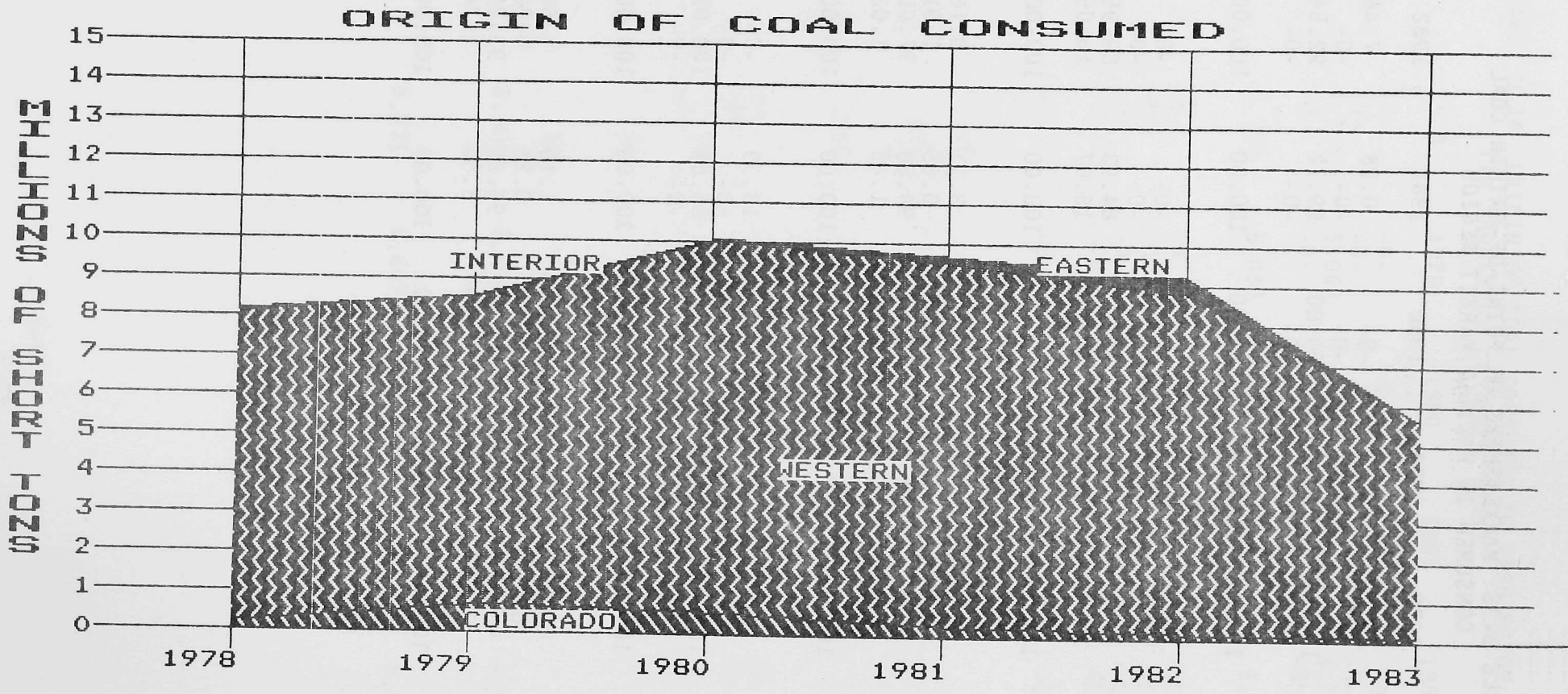
TABLE 3-34 ORIGIN OF COAL CONSUMED IN WASHINGTON
(In Thousands of Short Tons)

	1978	1979	1980	1981	1982	1983
STEAM						
Eastern	-0-	-0-	-0-	2	375	-0-
Interior	-0-	-0-	-0-	-0-	-0-	-0-
Rocky Mtn.	4,755	5,063	5,140	4,635	4,161	3,778
Colorado	-0-	-0-	-0-	-0-	-0-	-0-
TOTAL	4,755	5,063	5,140	4,637	4,536	3,778
MET						
Eastern	-0-	-0-	-0-	-0-	-0-	-0-
Interior	-0-	-0-	-0-	-0-	-0-	-0-
Rocky Mtn.	-0-	-0-	-0-	-0-	-0-	-0-
Colorado	-0-	-0-	-0-	-0-	-0-	-0-
TOTAL	-0-	-0-	-0-	-0-	-0-	-0-
INDUSTRIAL						
Eastern	18	11	17	12	3	5
Interior	3	25	31	20	25	20
Rocky Mtn.	504	520	292	274	306	177
Colorado	5	11	10	32	20	-0-
TOTAL	530	567	350	338	354	202
RESIDENT/COM.						
Eastern	-0-	-0-	-0-	16	-0-	-0-
Interior	-0-	-0-	11	-0-	-0-	-0-
Rocky Mtn.	46	35	149	104	167	240
Colorado	-0-	-0-	-0-	1	-0-	-0-
TOTAL	46	35	160	121	167	240
TOTAL						
Eastern	18	11	17	30	378	5
Interior	3	25	42	20	25	20
Rocky Mtn.	5,305	5,618	5,581	5,013	4,634	4,195
Colorado	5	11	10	33	20	-0-
TOTAL	5,331	5,665	5,650	5,096	5,057	4,220

TABLE 3-35 MARKETSHARE OF POINT-OF-ORIGIN COAL CONSUMED IN PACIFIC MARKET REGION

	1978	1979	1980	1981	1982	1983
STEAM						
Eastern	-0-	-0-	-0-	0.28	7.46	-0-
Interior	-0-	-0-	-0-	-0-	-0-	-0-
Rocky Mtn.	100.00	100.00	100.00	99.72	92.54	100.00
Colorado	-0-	-0-	-0-	-0-	-0-	-0-
TOTAL	100.00	100.00	100.00	100.00	100.00	100.00
MET						
Eastern	0.07	-0-	-0-	-0-	-0-	-0-
Interior	-0-	-0-	-0-	-0-	-0-	-0-
Rocky Mtn.	80.53	55.95	69.31	84.93	89.95	-0-
Colorado	19.40	44.05	30.69	15.07	10.05	-0-
TOTAL	100.00	100.00	100.00	100.00	100.00	100.00
INDUSTRIAL						
Eastern	1.06	0.69	0.96	3.11	0.16	0.56
Interior	0.74	1.75	1.68	0.85	1.81	1.98
Rocky Mtn.	97.77	96.87	96.65	94.60	97.00	88.17
Colorado	0.43	0.69	0.71	1.45	1.03	9.29
TOTAL	100.00	100.00	100.00	100.00	100.00	100.00
RESIDENT/COM.						
Eastern	-0-	-0-	-0-	13.39	-0-	-0-
Interior	-0-	-0-	6.29	-0-	-0-	-0-
Rocky Mtn.	100.00	100.00	93.71	86.61	100.00	100.00
Colorado	-0-	-0-	-0-	-0-	-0-	-0-
TOTAL	100.00	100.00	100.00	100.00	100.00	100.00
TOTAL						
Eastern	0.26	0.15	0.19	1.10	4.66	0.16
Interior	0.17	0.38	0.44	0.21	0.38	0.57
Rocky Mtn.	96.05	90.91	93.98	96.20	93.22	96.61
Colorado	3.52	8.55	5.39	2.50	1.74	2.66
TOTAL	100.00	100.00	100.00	100.00	100.00	100.00

FIGURE 3-7 ORIGIN OF COAL CONSUMED IN PACIFIC MARKET REGION



SECTION 4

4.0 SUMMARY

4.1 Colorado Coal Industry and Market Structure

A restructuring of the American economy is altering the relationship of coal buyers and coal sellers. The Colorado coal industry is undergoing profound changes in response to this continuing process of restructuring and reorganization. Coal producers and some coal consumers are attempting consolidation. Higher levels of productivity and lower unit costs may be achieved through this mechanism.

Petroleum companies are merging, acquiring assets of other firms and in the process becoming larger and more concentrated within the industry. Coal properties held by petroleum firms are changing hands through these mergers. In the first quarter of 1984 Texaco bought Getty, SoCal purchased Gulf and Damson Oil acquired Dorchester Gas. Together these takeovers involve Colorado coal producers with a 22.8 percent share of the 1983 State coal production. Other mergers and acquisitions have exchanged coal properties since 1983. Williams Companies purchased Northwest Energy, holders of the Hawk's Nest East and West, KN Energy acquired coal mines and properties from CF&I, Apache Energy and Minerals bought the Sunlight Mine in Garfield County, and Perma Resources is positioned in a joint venture in Kaiser Steel coal holdings and markets.

In a short period of time a significant amount of producing mines and coal reserves have changed hands. The impact on the Colorado coal industry is up to individual decisions of managers at new coal-holding companies. The national trend to consolidated holdings within raw material producers is certain to affect the corporate structure of the Colorado coal industry in the short-term.

Economic changes within coal consumers are affecting changes within the coal industry. Steel company mergers fall prey to antitrust laws since the steel industry is highly concentrated. Steelmakers must mobilize to counter foreign steel which is not subject to similar antitrust provisions and are benefitted by lower wage rates. If prevented from reinvesting in the steel industry through mergers, diversification will take place. As an integrated coal consumer, steelmaker mergers would lead to higher productivity met coal operations through closure of inefficient mines and upping capacity at more efficient operations.

The result in increased competitive pressures from either outside competition and/or deregulation will change the coal industry. Railroads, petroleum firms and steelmakers all hold coal. These industries must compete with foreign and domestic products or substitutes of equal or higher quality and lower price. Trade restraints or regulations typically delay the need to compete directly with a foreign product, however, in the long-run competition is necessary.

Free markets bear a price. Surging economies of countries rebuilt after World War II have accelerated market changes since the late 1960's for which America is just now adjusting. Consolidation will affect all industries. Antitrust, to a certain extent, is no longer a valid concept since outside competitors can supply many of the goods once a captive market for American companies.

Petroleum firms merge to form larger ones. Similarly, steelmakers and railroads desire to merge to meet other forms of foreign and domestic competition. If not allowed to follow a course directed by the free market, true competition is disallowed to the detriment of all consumers. These three basic industries have a fundamental stake in the coal industry. It is most probable that consolidation in the coal industry will follow consolidation in holding and producing companies.

4.1.1 Colorado Coal Producers

Table 4-1 is a breakdown of Colorado coal production by corporate entity. The categories are as follows:

- Petroleum
- Conglomerates, Consortiums and Captive Producers
- Independents and Others

Petroleum-backed companies lost production marketshare, falling from 43 to 36 percent of overall production from 1981 to 1983. The other categories gained marketshare with only slight decreases in production. Most of the decline in production of Colorado coal occurred at the expense of companies with a petroleum-based parent company.

TABLE 4-1 MARKETSHARE OF PRODUCTION BY CORPORATE ENTITY

Corporate Type	1981	Percent of Total	1983	Percent of Total	Percent Change
Petroleum	8,347,314	43.18	6,119,000	36.78	-26.7
Conglomerates Consortiums Captive	7,849,411	40.60	7,400,000	44.48	-5.7
Independents and Other	3,135,923	16.22	3,117,000	18.74	-0.6
TOTAL	19,332,648	100.00	16,636,000	100.00	-13.9

Both production and product quality, in terms of heating value, declined between 1981 and 1983. Table 4-2 lists production by corporate entity and mining method for 1981 and 1983. Independents produced the highest heating value coal in both years with surprising consistency, coincidentally, considering the changes in production mix and marketshare.

Conglomerates, consortiums and captive producers represent dedicated coal production, at this time most coal in this category in Colorado is captive or mainly assigned by contract. Product quality dropped slightly in both underground and surface mines as demand requirements changed.

Petroleum companies lost the greatest marketshare while product quality slipped slightly from underground mines and gained from surface mines. Production from these surface mines fell over 30 percent, but those remaining produce higher quality coal.

TABLE 4-2 PRODUCTION AND HEATING VALUE BY CORPORATE ENTITY (short tons)

	Production 1981	Btu/lb	Production 1983	Btu/lb
PETROLEUM COMPANIES				
Underground	3,162,601	11,605	2,624,000	11,207
Surface	5,184,713	11,171	3,495,000	11,305
Subtotal	8,347,314	11,335	6,119,000	11,262
CONGLOMERATES, CONSORTIUMS AND CAPTIVE PRODUCERS				
Underground	1,330,511	12,823	814,000	11,793
Surface	6,518,900	10,430	6,576,000	10,357
Subtotal	7,849,411	10,835	7,400,000	10,516
INDEPENDENTS AND OTHER PRODUCERS				
Underground	2,090,180	12,360	2,330,000	12,210
Surface	1,045,743	10,629	787,000	10,422
Subtotal	3,135,923	11,788	3,117,000	11,758
SUMMARY				
Underground Subtotal	6,583,292	12,093	5,778,000	11,695
Surface Subtotal	12,749,356	10,747	10,858,000	10,667
GRAND TOTAL	19,332,648	11,205	16,636,000	11,024

4.1.2 Colorado Coal Consumers

Consumers of Colorado coal are situated over a wide geographic area, and have similarly diverse reasons for consuming Colorado coal. Selection of Colorado coal in national product and geographic markets is determined by its relative desirability with respect to substitutes. Table 4-3 lists the percentage domestic distribution of Colorado coal products.

TABLE 4-3 COLORADO COAL PRODUCT MARKETS (PERCENT)

Coal Product	1978	1979	1980	1981	1982	1983
Steam	75.3	76.6	76.3	77.9	79.7	78.5
Met	16.4	16.8	14.0	11.5	7.2	5.4
Industrial	7.9	6.2	9.1	10.1	12.3	15.4
Residential	0.4	0.4	0.6	0.5	0.8	0.7
Total	100.0	100.0	100.0	100.0	100.0	100.0

The importance of the steam coal product market to Colorado has increased. In 1978, 75.3 percent of the domestic distribution went to raising steam. In 1983, 78.5 percent of production was devoted to steam. Steam coal production peaked in 1981 at 14.5 mtpy and was at a level of 12.2 mtpy in 1983.

The decline of the steelmaking industry within the market region of Colorado coal reduced production of an important Colorado coal product. Met coal production peaked at 3.0 mtpy in 1979. The 1983 production level was about 850,000 tpy. Met coal constituted 16.4 percent of domestic Colorado production in 1978, however, due to changes in demand it represented only 5.4 percent of production in 1983.

The industrial coal product market is the only market where increases in marketshare of Colorado production and increases of production are noted. In 1978, 7.9 percent of Colorado production went to industrial applications. For the year 1983, 15.4 percent of Colorado coal was used in this product market. In absolute terms, Colorado industrial coal product production increased from 1.0 mtpy in 1978 to 2.3 mtpy in 1983.

Residential and commercial coal products markets for Colorado are relatively unimportant, 65,000 to 107,000 tpy between 1978 and 1983, and have declined in significance. Since 1978 residential/commercial coal product markets increased from 0.4 to 0.7 percent of total Colorado production.

Within the broad domestic geographic market coal demand varied only plus or minus 3 mtpy since 1980 about an average of 294,000 mtpy. Table 4-4 lists the aggregated coal consumption for domestic Colorado coal product markets. Steam coal consumption jumped between 1978 and 1980 and is increasing in small steps. Met coal consumption is down 42 percent since the peak year 1979. Within the geographic market industrial coal consumption is almost unchanged since 1978. Residential and commercial use of coal is up 187 percent since 1978. Figure 4-1 shows these data graphically.

TABLE 4-4 ORIGIN OF COAL CONSUMED WITHIN THE DOMESTIC MARKET AREA OF COLORADO
(In Thousands of Short Tons)

	1978	1979	1980	1981	1982	1983
STEAM						
Eastern	3,579	3,816	3,276	2,621	2,693	3,949
Interior	84,126	98,998	103,536	94,682	104,811	107,825
Rocky Mtn.	94,230	114,265	132,532	137,611	137,789	137,343
Colorado	10,010	13,992	14,322	14,536	13,999	12,194
TOTAL	191,945	231,071	253,666	249,450	259,292	261,311
MET						
Eastern	11,233	12,229	11,210	10,759	7,412	8,358
Interior	2,668	3,669	3,507	3,041	2,615	2,380
Rocky Mtn.	1,514	1,246	1,517	1,428	1,399	33
Colorado	2,176	3,060	2,631	2,141	1,273	841
TOTAL	17,591	20,204	18,865	17,369	12,699	11,612
INDUSTRIAL						
Eastern	1,526	1,780	1,748	2,322	1,538	1,375
Interior	10,706	14,479	11,521	12,321	12,451	12,181
Rocky Mtn.	7,346	8,656	5,859	7,018	6,839	5,175
Colorado	1,044	1,141	1,705	1,887	2,160	2,385
TOTAL	20,622	26,056	20,833	23,548	22,988	21,116
RESIDENT/COM.						
Eastern	104	41	97	75	76	85
Interior	257	264	506	808	1,112	1,236
Rocky Mtn.	295	314	689	619	706	642
Colorado	65	65	114	96	136	107
TOTAL	721	684	1,406	1,598	2,030	2,070
TOTAL						
Eastern	16,442	17,866	16,331	15,777	11,719	13,767
Interior	97,757	117,410	119,070	110,852	120,989	123,622
Rocky Mtn.	103,385	124,481	140,597	146,676	146,733	143,193
Colorado	13,295	18,258	18,772	18,660	17,568	15,527
TOTAL	230,879	278,015	294,770	291,965	297,009	296,109

FIGURE 4-1 ORIGIN OF COAL CONSUMED IN OVERALL GEOGRAPHIC MARKET

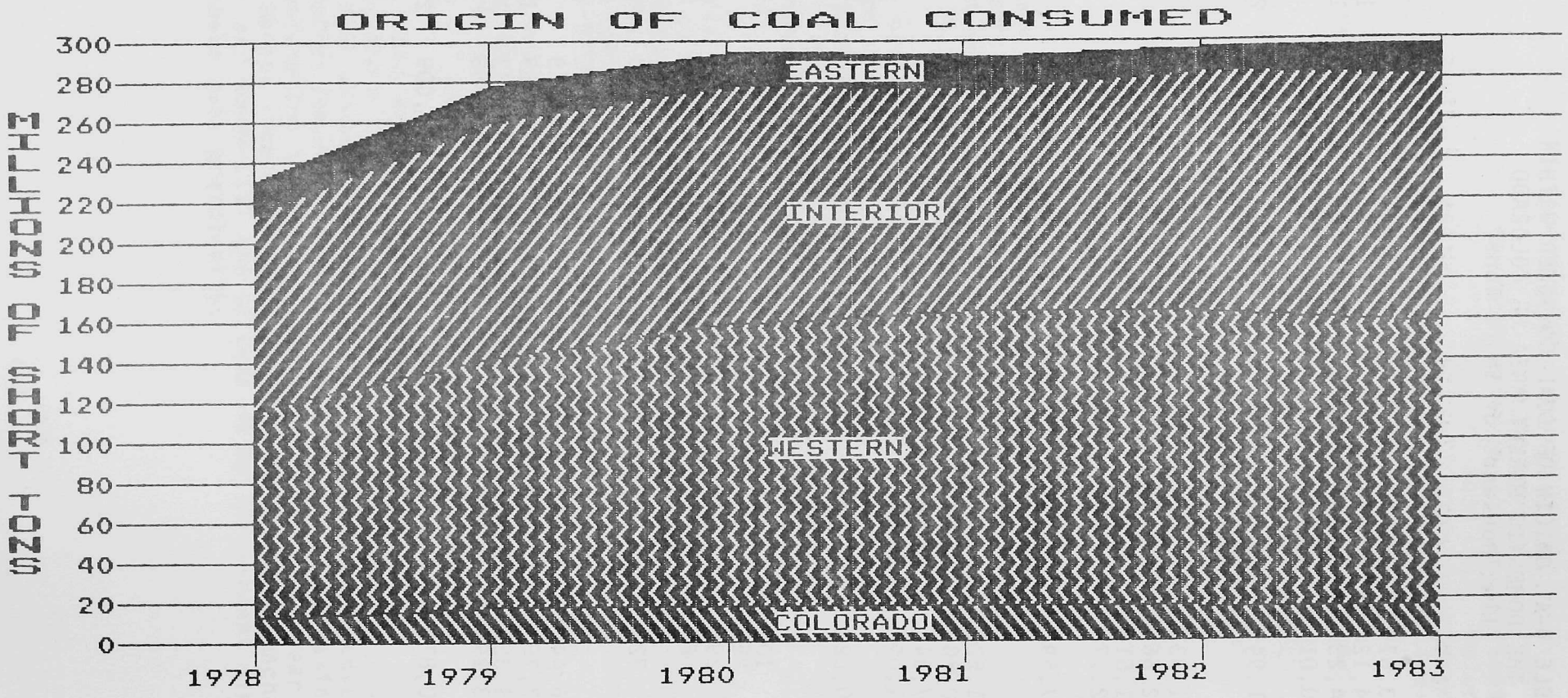


Table 4-5 lists the marketshare of point-of-origin coal destined for the various product markets. The geographic market of Colorado coincides with the geographic market of other states within the Mountain Market Region and the Interior and Eastern Coal Provinces to the east of Colorado. Competition is marked within the Mountain Market Region and is not reduced, but increased with distance from Colorado. Other coal-producing states and provinces provide price and quality competition at every point of sale.

In the steam coal product market western coals, Rocky Mountain and Colorado, lost marketshare since 1981. Consumption of Eastern and Interior Coal Province coals increased slightly. In 1978, Western coals held a 45.7 percent share of the steam coal product market within the Colorado geographic market. In 1983 Western coal producers held a 57.2 percent share of the market, down from a peak marketshare of 61.0 percent in 1981. Colorado is losing marketshare at a faster rate than other western producers. Gains are coming from Eastern, and especially, Interior Coal Province coals. In a stagnant market, loss of marketshare is equivalent to loss in production.

The met coal product market is tied to changes in steel production and to changes within the steel industry. Reorganization of steelmakers consolidated production in facilities at the periphery of the Colorado coal market region. Within the Mountain Market Region only U.S. Steel remains as a consumer of met coal. Due to changes in the geographic market and changes in demand, marketshare of Colorado met coal is at its low point. Consumption of met coal by states within the overall Colorado geographic market shifted demand-derived production to the Eastern Coal Province.

Within one year, 1982 to 1983, the Eastern Coal Province jumped from a 58 to 72 percent share of the met coal market, the Interior Coal Province held at about 20 percent while Colorado fell from 10 to 7.2 percent. As the market is in decline at least in the short-term, production marketshare will fall, however Colorado met coal production will stabilize at the level required by U.S. Steel.

Industrial coal consumption is almost unchanged in real terms since 1978. Despite shifting demand areas, Colorado increased marketshare from 5.0 percent in 1978 to 11.3 percent in 1983. Other western industrial coal product producers lost marketshare. The Eastern and Interior Coal Provinces held a 59.3 percent of the market in 1978 and a 64.2 percent marketshare in 1983. Colorado is gaining marketshare in the industrial coal product market mainly at the expense of other Rocky Mountain coal producers. Due to general slow growth, increased marketshare yields small absolute production gains.

The residential and commercial coal product sector is the most volatile and is most sensitive to weather conditions and economic circumstances. In addition, this coal product is less concerned with product quality than price and hence is the most limited geographic market for coal. The Interior Coal Province marketshare rose from 35.6 percent in 1978 to 59.7 percent in 1983. Western Coal Province coals fell from a total of 58.9 percent in 1978 to 36.2 percent in 1983. Demand increases since 1978 have allowed modest production increases for Western producers despite falling marketshare. The overall market for residential/commercial coal products is small and is served by excess capacity of many mines on the open market.

TABLE 4-5 MARKETSHARE OF POINT-OF-ORIGIN COAL CONSUMED WITHIN DOMESTIC MARKET AREA OF COLORADO

	1978	1979	1980	1981	1982	1983
STEAM						
Eastern	1.86	1.65	1.29	1.05	1.04	1.51
Interior	43.83	42.84	10.82	37.96	40.42	41.26
Rocky Mtn.	49.09	49.45	52.25	55.17	53.14	52.56
Colorado	5.22	6.06	5.65	5.83	5.40	4.67
TOTAL	100.00	100.00	100.00	100.00	100.00	100.00
MET						
Eastern	63.86	60.53	59.42	61.94	58.37	71.98
Interior	15.17	18.16	18.59	17.51	20.59	20.50
Rocky Mtn.	8.61	6.17	8.04	8.22	11.02	0.28
Colorado	12.37	15.15	13.95	12.33	10.02	7.23
TOTAL	100.00	100.00	100.00	100.00	100.00	100.00
INDUSTRIAL						
Eastern	7.40	6.83	8.39	9.86	6.69	6.51
Interior	51.92	55.57	55.30	52.32	54.16	57.69
Rocky Mtn.	35.62	33.22	28.12	29.80	29.75	24.51
Colorado	5.06	4.38	8.18	8.01	9.40	11.29
TOTAL	100.00	100.00	100.00	100.00	100.00	100.00
RESIDENT/COM.						
Eastern	14.42	5.99	6.90	4.69	3.74	4.11
Interior	35.64	38.60	35.99	50.56	54.78	59.71
Rocky Mtn.	40.92	45.91	49.00	38.74	34.78	31.01
Colorado	9.02	4.38	8.11	6.01	6.70	5.17
TOTAL	100.00	100.00	100.00	100.00	100.00	100.00
TOTAL						
Eastern	7.12	6.43	5.54	5.40	3.95	4.65
Interior	42.34	42.23	40.39	37.97	40.74	41.75
Rocky Mtn.	44.78	44.77	47.70	50.24	49.40	48.36
Colorado	5.76	6.57	6.37	6.39	5.91	5.24
TOTAL	100.00	100.00	100.00	100.00	100.00	100.00

Statistical analysis of point-of-origin of coal among all geographic markets of Colorado coal indicated no relation of the behavior of other Rocky Mountain producers to production from Colorado. Only the East and West South Central and Mountain Market Regions showed significant correlations, r2 of 0.95 and 0.99, respectively. The correspondence is indicative of a westward shift in preference of point-of-origin in the Gulf Coast market, however, no cause and effect is demonstrated. In the Mountain Market Region, a high correlation was observed. Here the relationship is inverse since the Mountain Market Region supplies almost all of its own coal, increasing marketshare of Wyoming coal decreases that of Colorado. The notion that a "pull-up" effect from increased demand of Wyoming coal will increase coal demand from Colorado is not supported statistically.

The coal marketplace is increasingly price competitive. The Colorado coal industry is, on average, a high-cost producer of coal. The limits of the Colorado geographic market are contained, in part, by transport costs higher than those due to distance alone. Colorado's relatively rugged physiography is the prime determinant of mining method selection and a deterrent to low rail transport charges.

Colorado coal product desirability is declining and the geographic market is shrinking. Delivered equivalent price is the criteria most coal buyers use to discriminate between various coals. Reducing either transport charge or mined cost of coal or both may restore price competitiveness. The ability of Colorado producers to become price-searchers and still remain economic will determine the viability of the Colorado coal product in its historic geographic market.

4.2 Cost of Colorado Coal

4.2.1 Cost of Coal

Table 4-6 lists mining productivity by state, mining method and region. Within the Western Coal Province only Utah has lower overall productivity per miner hour than does Colorado. Underground mining requires greater amounts of labor input than do surface mines. Colorado relies extensively on underground mining, and surface mining in Colorado is unable to achieve the productivity of Powder River Basin mines in Wyoming or Montana due to dissimilar geologic conditions.

Since Colorado coal is losing marketshare based, apparently, on price an examination of the pricing mechanism is required. The geology of coal regions, coal fields and individual mines impinges directly upon cost and price setting. Product quality and price are inseparable in this respect.

In general, Colorado coal production regions are located in more rugged terrain than the coal fields in the Powder River Basin of Wyoming and Montana. This physiographic difference influenced the development of railroads, chief transporters of coal, and selection of current mining methods. Colorado's rugged terrain and more restrictive geologic settings limits sites available for surface mining. Surface mines yield two-thirds of Colorado's coal production, however, the mines are smaller and not directly cost-competitive with those in the Powder River Basin.

TABLE 4-6 U.S. COAL MINING PRODUCTIVITY BY COAL PROVINCE AND STATE AND BY TYPE OF MINING: 1982
(Short Tons of Coal Produced per Miner Hour)

Coal Producing Region and State	1982 Total Productivity	1982 Type of Mining Underground	1982 Type of Mining Surface
U.S. Total.....	2.11	1.37	3.36
Eastern Total.....	1.51	1.28	2.06
Alabama.....	1.52	1.03	2.35
Kentucky, Eastern.	1.79	1.48	2.33
Maryland.....	1.85	1.58	2.24
Ohio.....	1.63	1.08	2.19
Pennsylvania.....	1.40	1.13	1.75
Tennessee.....	1.29	1.18	1.54
Virginia.....	1.47	1.38	2.00
West Virginia.....	1.38	1.29	2.01
Interior Total.....	2.38	1.65	2.93
Arkansas.....	0.86	-	0.86
Illinois.....	1.97	1.68	2.57
Indiana.....	2.61	1.77	2.68
Iowa.....	2.06	-	2.06
Kansas.....	2.15	-	2.15
Kentucky,Western..	2.01	1.59	2.58
Missouri.....	2.25	-	2.25
Oklahoma.....	1.66	1.29	1.66
Texas.....	5.33	-	5.33
Western Total.....	6.26	1.88	8.90
Alaska.....	5.96	-	5.96
Arizona.....	6.22	-	6.22
Colorado.....	2.68	1.62	4.25
Montana.....	12.27	-	12.27
New Mexico.....	5.33	1.13	6.17
North Dakota.....	9.27	-	9.27
Utah.....	2.05	2.05	-
Washington.....	3.41	-	3.41
Wyoming.....	11.06	2.04	11.67

(Modified after EIA Production Report, 1983)

Table 4-7 shows the marketshare of Colorado coal production by region for 1981 and 1983. The largest marketshare for coal consumed in-state is enjoyed by the Green River Coal Region with about 75 percent. In the out-of-state market the Uinta Coal Region has a 66 percent marketshare followed by the Green River Coal Region with 24 percent. The most significant change in marketshare fell upon the Raton Mesa Coal Region where the in-state product market for met coal was nonexistent. Since coal is a demand-derived commodity, mining has ceased for the duration of the decline of the met coal product market. Similarly, recessionary effects may be the cause for decline in marketshare in the North Park and San Juan River Coal Regions where coals are used mainly for industrial and commercial purposes in relatively small geographic markets.

TABLE 4-7 MARKETSHARE OF PRODUCTION AND DISTRIBUTION OF COLORADO COAL BY COAL REGION

Coal Region	In-State		Out-of-State	
	1981	1983	1981	1983
Canon City	1.31	6.42	1.76	4.00
Denver	0.08	1.82	-0-	-0-
Green River	74.17	75.21	29.31	24.26
North Park	0.32	0.04	5.65	1.37
Raton Mesa	7.12	-0-	0.75	0.61
San Juan	0.96	0.89	4.37	3.42
Uinta	16.05	15.62	58.15	66.34
Total	100.01	100.00	99.99	100.00

It is not surprising that the Green River and Uinta Coal Regions supply much of the coal to Colorado's in-state and out-of-state markets. The coals of the two regions, despite wide variations in nomenclature, are correlative. In other words, the regions are segregated mainly by physiographic differences, and coals are influenced by localized geologic conditions. For example, the Uinta Coal Region is composed of rugged terrain with mainly underground mines while the Green River Coal Region is of more moderate topography and mining is mainly by surface methods.

The Green River Coal Region has a 75 percent marketshare of 1983 in-state consumption. Approximately 94 percent of this amount is surface-mined coal. The typical heating value content of Green River Coal Region coals is about 10,600 Btu/lb. The Uinta Coal Region has a 66 percent marketshare of the 1983 out-of-state product market. Nearly 60 percent of this amount is mined by underground methods. The weighted average heating value for underground-mined coal in the out-of-state market is 11,974 Btu/lb. The higher heating value of Uinta Coal Region coals is ascribed to higher geothermal gradients associated with Tertiary volcanism in the Gunnison area. Coals were locally heated higher ranks than similar near-surface coals elsewhere within the coal region.

Equivalent cost is the determining factor in the decision to purchase coal. Low-cost equivalents are sought, and high-cost equivalents are the supply of last resort. Table 4-8 lists average 1982 F.O.B. mine price by state and mining method. The 1982 weighted average price of U.S. coal was $27.25. In the national coal market Eastern Coal Province producers are the high cost suppliers, Interior Coal Province coals produce at mid-range and western miners are the low-cost producers.

TABLE 4-8 U.S. COAL PRODUCTION AND AVERAGE MINE PRICE BY COAL PRODUCING REGION: 1982
(In thousands of short tons)--From EIA Coal Production Reports

Coal Producing Region and State	Total Production	Total Average Mine Price ($)
U.S. Total	832,524	27.25
Eastern Total	427,889	34.63
Alabama	26,226	43.23
Kentucky, Eastern	109,030	30.87
Maryland	3,764	32.45
Ohio	36,337	32.13
Pennsylvania	78,279	33.71
Tennessee	7,287	29.49
Virginia	39,068	34.57
West Virginia	127,899	37.72
Interior Total	177,910	24.50
Arkansas	138	39.93
Illinois	60,259	28.84
Indiana	31,722	24.69
Iowa	564	21.81
Kansas	1,401	26.61
Kentucky, Western	38,900	29.25
Missouri	5,336	25.68
Oklahoma	4,770	32.54
Texas	34,818	10.13
Western Total	226,724	15.48
Alaska	833	W
Arizona	12,364	W
Colorado	18,307	22.48
Montana	27,882	13.57
New Mexico	19,940	19.19
North Dakota	17,848	9.14
Utah	17,029	29.42
Washington	4,161	W
Wyoming	108,360	12.75

Within the Rocky Mountain region, Utah and Colorado are high cost producers with F.O.B. mine prices of $29.42 and $22.48, respectively. Quality factors make up for a portion of the relatively high price of Colorado coal in the product market for coal, but the geographic market is price-constrained.

Coals from the Green River Coal Region compete directly with Powder River Basin coals in the Colorado steam coal product market. Green River Coal Region coals are of higher quality, compared to Wyoming coals, but higher priced as well. Wyoming coal represents an intervening opportunity in the purchase of coal due to the price differential.

For example, Green River Coal Region coals with a weighted average value of 10,600 Btu/lb may be arbitrarily assigned the weighted average F.O.B. price of $18.76 for Colorado surface-mined coal. The resulting cost is $0.88 per million Btu's. On the other hand, Wyoming coal contains a typical heating value of 9,200 Btu/lb. Assigned a weighted average state F.O.B. mine price of $12.75 per ton the outcome is a Wyoming mine-mouth cost of $0.69 per million Btu's.

Transport cost adds to delivered cost. Since Wyoming coal is gaining marketshare in Colorado it is apparent that the total cost and desirability of Wyoming coal, mining cost plus transportation, is less than the delivered cost of Colorado coal within the State.

4.2.2 Cost of Transport

Central Colorado was bypassed in the building of the first transcontinental railroads. This factor is significant since subsequent development moved away from the main line into areas developing at the time. This sunk cost greatly influences the marketability of coal today. Some areas of Colorado are poorly served by rail or served by lightweight rail which prevents unit-train access. Some mines in this situation must truck coal to a railhead which adds to total cost since trucks are nearly four times more expensive on a per-ton-mile basis and lengthens the chain-of-transfer for coal.

For instance, the coal field of North Park cannot be fully developed until the line is upgraded from Walden to Hebron (URS, 1976). The formerly highly productive Durango field must truck coal to railheads in New Mexico for transshipment. In addition, there is no direct connection for coal in northwestern Colorado westward on the Union Pacific line through Wyoming. Limiting the market area reduces the sales potential of Colorado coal in the western United States and export market.

The terrain of Colorado further limits export potential of Colorado coal and receiving a larger share of new contracts. Most production is in northwestern and central-west Colorado and there are only two rail passes to the east, Moffat Tunnel and Tennessee Pass. The Moffat Tunnel brings coal for shipment to points east, Denver and out-of-state. The Tennessee Pass route has the advantage of skirting much of the Front Range; however, it is more difficult and expensive to use since it has steeper grades. Steep grades slow traffic and reduce capacity of a single line track. Grades in excess of 1.0 to 1.4 percent are barriers to movement of unit trains. On steep grades trains must be broken up or slave locomotives must be added to increase drawbar pull (URS, 1979).

The Staggers Rail Act of 1980 effectively deregulated rail rates for hauling coal. The Staggers Act allows contract service and sets rate levels below which rates are not subject to ICC review. Deregulation of rail rates allows competitive forces to operate only when competition is present. The only potential competition railroads face in bulk transport is the slurry pipeline. According to a report in the Wall Street Journal, Energy Transmission Systems, Inc. lost a bid to transport coal by slurry pipeline from Wyoming to Arkansas. The coal purchaser in this case, Arkansas Power and Light, signed with the Chicago and Northwestern Railroad.

A February 1983 ICC proposal would allow railroads to increase rates by 15 percent per year until revenue adequacy is attained (Tukenmez, 1983). Revenue adequacy is defined as a net return on investment equal to the three year average cost of capital. Changing rail rates complicate long-term contract sales. Unpredictable rail rates limits the geographic market and may induce fuel-switching or contract renegotiation when the choice is available.

Projections made by the Coal Supply and Transportation Model indicate that total coal production falls steadily with increasing rail rates (Tukenmez, 1983). Most production declines occur in the west due to longer rail hauls. Coal production shifts from west to east in part due to the relatively lower heating value of many Western Coal Province coals, which is a transport disadvantage in bulk shipments.

Given large increases in transportation costs coal consumers will employ the following mitigation measures:

- Substitute coal suppliers
- Substitute transportation methods
- Substitute fuels

Coal consumers at the outer limits of the geographic market will tend to purchase coal from other suppliers. Due to the lack of economic alternate modes of transportation, most western coal producers are captive to rail haulage. Coal currently enjoys a significant cost advantage over other fuels although rail rates rising to the limit of the marginal cost of an alternate fuel could disrupt coal conversion trends and alter the growth of coal use. Tables 4-9 and 4-10 list rail rate increases interstate and in Colorado since 1978 (King, written commun., 1984).

Export coal carriers were decontrolled in September, 1983. Since western coal producers are typically captive to one railroad the lack of competition in rail service coupled with decontrol is an inequity in selection of western coal for export.

TABLE 4-9 INTERSTATE RATE INCREASES ON COAL IN CHRONOLOGICAL ORDER
PRICE INDEX JANUARY 1, 1978=1000

EFFECTIVE DATE INTERSTATE	TEMPORARY INCREASE NUMBER	TEMPORARY INCREASE PERCENTAGE	PERMANENT INCREASE NUMBER	PERMANENT INCREASE PERCENTAGE	TEMPORARY INDEX NUMBER	PERMANENT INDEX NUMBER
1-1-78						1000
			(X-330)	(5%)		
			(X-336)	(4%)		
			(X-343)	(5%)		
6-18-78			X-349	4%		1040
12-15-78	X-357-A	7.0%			1113	
2-23-79	Sup 8	8.0%		8%		1123
6-5-79	X-311	1.2%			1136	
7-7-79	Sup 9	1.4%			1152	
7-28-79	Sup 13	2.4%			1163	
9-14-79	Sup 24	3.5%			1176	
10-1-79	X-368	7.8%			----	
10-1-79			X-368-A	12.5%		1263
1-18-80	X-311-A	1.1%			1277	
2-27-80	X-374	2.0%			1303	
4-1-80	X-375	4.0%			1328	
4-1-80	X-375-A	5.1%			1342	
4-11-80	*X-311-S	1.2%			1358	
5-23-80	X-311-B	0.8%			1369	
7-12-80	X-375-B	All exceptions				
7-12-80			X-375-C	13.9%	1456	
12-31-80			X-386	5.0%	1529	
1-17-81	X-311-C	1.1%			1546	
3-14-81	X-311-D	2.2%			1563	
4-7-81	X-311-E	2.9%			1573	
4-10-81	*X-311-S	-0-				1555
6-5-81	X-001	4.0%			1617	
7-1-81	X-002	2.8%			1662	
10-1-81			X-003	8.4%		1686
1-1-82			X-082	4.7%		1765
1-1-83	X-083	1.0%			1783	
10-9-83			X-083-A	1.2%		1786
1-1-84			X-084	4.1%		1859

* X-311-S was a surcharge which expired--the only rate reduction. (King, written commun., 1984).

TABLE 4-10 INTRASTATE RATE INCREASES ON COAL IN CHRONOLOGICAL ORDER
PRICE INDEX JANUARY 1, 1978 = 1000

EFFECTIVE DATE INTRASTATE	TEMPORARY INCREASE NUMBER	TEMPORARY INCREASE PERCENTAGE	PERMANENT INCREASE NUMBER	PERMANENT INCREASE PERCENTAGE	TEMPORARY INDEX NUMBER	PERMANENT INDEX NUMBER
1-1-78						1000
2-11-78			X-330	5%		1050
8-1-78			X-336	4%		1092
6-28-79			X-343	5%		1147
7-20-79	X-311	1.2%			1161	
8-30-79	Sup 13	2.4%			1189	
1-2-80	Sup 24	*3.4%			1200	
2-24-80	X-311-A	1.1%			1213	
3-5-80			X-349	4%	1262	
4-23-80	X-311-S	**1.2%			1277	
6-7-80			X-357-A	8%	1379	
6-27-80	X-375-A	***5.1%				
7-7-80	X-311-B	0.8%			1390	
4-10-81	X-311-S	**-0-			1374	
6-22-81			X-368-A	12.5%		(1449)
6-22-81			X-375-C	13.9%		(1650)
6-22-81			X-386	5.0%		(1733)
6-22-81	X-001	4.0%			1802	
7-1-81	X-002	2.8%			1852	
10-1-81			X-003	8.4%		1879
1-1-82			X-082	4.7%		1967
1-1-83	X-083	1.0%			1987	
10-9-83			X-083-A	1.2%		1991
1-1-84			X-084	4.1%		2073

NOTE: The intrastate chronology is different because some increases were appealed to the ICC and some were just never filed in Colorado. 6-22-81 was the date of ICC order preempting PUC under Staggers Act.

* 0.1% less than interstate by PUC Order after hearing

**X311-S was a surcharge which expired - only rate reduction

***Union Pacific only was granted X375-A in Colorado. The effect on coal rates may be ignored, generally, intrastate. (King, written commun., 1984).

4.2.3 Cost of Delivered Coal

Table 4-11 lists average F.O.B. cost of Colorado coal by mining method from EIA coal production reports. Between 1978 and 1982 the average cost of Colorado underground-mined coal increased 2.9 percent per year, from $26.23 in 1978 to $29.05 per ton in 1982. Surface-mined coal increased in cost at an average rate of 9.8 percent per year from $13.07 per ton in 1978 to $18.76 per ton in 1982. Coal prices increased at a rate of 6.96 percent per year between 1978 and 1982.

TABLE 4-11 COLORADO MINE PRICES ($/t)

	UNDERGROUND	SURFACE	AVERAGE
1978	26.23	13.07	17.37
1979	24.00	13.13	16.72
1980	27.24	16.43	19.89
1981	29.33	17.45	21.38
1982	29.05	18.76	22.48
1983	N/A	N/A	N/A

Modified from EIA Coal Production Reports

Table 4-12 lists Colorado production by mine and assigns a reported or probable heating value to each operation. The overall weighted average heating value was computed for the years 1978 through 1983. Table 4-13 lists average cost per ton and heating value for Colorado coal. On a cost per million Btu basis Colorado coal increased 6.19 percent per year, from $0.7725 to $1.0310 per million Btu's. The average 1983 F.O.B. mine price for Colorado was not available at the time of writing.

Table 4-14 shows the average price of Colorado coal, and the cost of hauling coal interstate from Colorado. The $10.00 value is an index number and is not intended to represent a specific rail haul. The escalation of interstate rail rates is presented in Table 4-9. The average increase in interstate rail rates was 12.4 percent per year from 1978 to 1983. Applied to the cost and quality of coal, the average delivered cost of coal on a per million Btu basis, increased 8.7 percent per year, from $1.2173 in 1978 to $1.8390 per million Btu's in 1983.

Table 4-15 displays the average price of Colorado coal, and the cost of hauling coal within Colorado. Again, the $10.00 value in 1978 is an index number representative of the escalation of rail rates and not a specific haul. The escalation of intrastate rail rates is presented in Table 4-10. The average annual increase in intrastate rail rates was 15.5 percent per year from 1978 to 1983. Applied to the cost and quality of coal, on a delivered cost per million Btu basis, the average rate of increase was 9.94 percent per year, ranging from $1.2173 in 1978 to $1.9333 in 1983.

On average, the cost of interstate and intrastate rail coal hauls is rising faster than the cost of coal. Rapid escalation in delivered cost of coal due primarily to large increases in the cost of rail haulage reduces the marketability of Colorado coal in-state, and in the domestic and international export markets. As a supplier of discretionary coal, rapid increases in the delivered cost of Colorado coal prompt consumers to seek substitutes.

TABLE 4-12 PRODUCTION AND COAL QUALITY BY MINE, 1978 TO 1983

MINE NAME	HEATING VALUE (BTU/LB)	1978	1979	1980	1981	1982	1983
ALLEN	13,150	495,120	634,700	561,737	486,705	220,763	
ANIMAS	11,500						98,190
APEX	11,758	14,402		4,258	22,547	46,959	28,498
BACON	8,815			39,041	3,579		
BEAR	12,400	226,705	250,152	239,217	259,392	91,845	179,922
BEAR CREEK	13,000	44,171	46,100	5,282			
BLUE RIBBON	12,600	15,294	89,373	101,771	129,055	150,963	72,130
BOURG STRIP	9,640				94,634	76,614	117,807
CAMEO	11,800		31,800	229,655	283,072	124,634	
CANADIAN STRIP	10,928	193,791	97,900	21,700	136,024		
CANON MONARCH	10,700		14,284				
CHIMNEY ROCK	13,230	38,676	78,786	8,425	255,013	259,477	252,500
CISSY LEE	12,600	3,592					
COAL BASIN	14,500	132,396	139,300	130,278	92,998	51,287	
COAL GULCH	12,000	13,851	3,600				
COLORADO COAL NO 1	12,200					26,334	
COLOWYO	10,728	1,072,113	1,699,400	2,642,084	3,130,390	3,153,419	3,021,617
DELAGUA NO 1	12,500	25,900	39,000				
DELAGUA NO 2	12,500	4,000		67,756			
DESERADO	10,100					32,113	186,155
DORCHESTER	11,100			73,317	172,599	584,832	566,174
DUTCH CREEK NO 1	14,500	161,208	147,100	156,533	45,386	77,463	228,813
DUTCH CREEK NO 2	14,000	225,464	208,200	181,145	257,492	241,927	495,757
EAGLE NO 5	10,500	539,616	556,100	473,773	693,062	1,200,681	649,326
EAGLE NO 9	10,500	79,065	173,000	180,259	70,854	271	42
EASTSIDE	13,200	253					1,680
EDNA STRIP	10,500	962,841	1,165,902	1,026,391	1,000,921	717,865	575,471
ELDER	9,500		366				
ENERGY STRIP NO 1	11,321	2,909,272	2,353,291	3,338,633	3,351,352	2,880,373	2,669,004
ENERGY STRIP NO 2	11,300	261,821	654,316				
ENERGY STRIP NO 3	11,300	334,745	425,398	255,825			
FOIDEL CREEK	11,350						21,549
FRUITA	11,300		1,100	2,379	2,416		
GEC STRIP	11,000	79,986	85,628	60,994	75,904	77,779	35,375
GRASSY CREEK	11,500			223,329	215,179	175,420	114,794
HASTINGS STRIP	10,700	2,580	10,375				
HAWKS NEST EAST	12,690	330,997	447,398	436,409	617,630	53,338	
HAWKS NEST WEST	12,690			6,438	84,461	557,337	
HAYDEN GULCH	9,978		378,835	553,555	577,973	583,186	448,250
HEALEY	12,000	18,258					
HELEN	11,500		19,000	11,743	5,756		14,580
JEWELL	11,500	6,050					
K-400 STRIP	10,000			8,515			
KEENESBURG	9,000				7,293	135,651	194,033
KING	13,529	66,046	93,700	87,189	135,368	121,068	65,077
LINCOLN	9,000	72,909					
LS WOOD	14,500	318,212	268,300	220,930	224,642	156,859	
MAD JACK	9,500		152	50			
MARR STRIP	9,700	513,866	687,600	724,126	287,954	114,808	32,309
MAXWELL	13,150	86,883	125,000	181,376	175,184		
MCCLANE CANYON	10,388	1,578	3,444	13,202	53,516	70,465	
MEADOWS STRIP	9,800	207,774	201,067	17,297	9,156		
MIDDLE CREEK	9,950		21,019	13,435			
MINE NO 1	9,800	16,962	127,440				
MT. GUNNISON	11,500					96,760	326,262
MUNGER CANYON	10,400	80,160					
NEWLIN CREEK	12,300	5,342	17,671	96,324	72,359	38,847	36,154
NORTHERN NO 1	10,900		6,244	71,959	5,800		
NUCLA	11,680	102,394	121,800	93,069	60,260	61,237	41,815
NUGAP	10,500	281	113				
OHIO CREEK	11,500		269	1,447	2,211	7,103	6,698
ORCHARD VALLEY	11,000	435,896	722,470	761,824	976,796	1,246,197	1,308,883
PEACOCK	13,400		100	656	305		
RED CANYON NO 1	10,600	426	9,840	93,258	137,698	64,442	8,728
RIENAU NO 2	10,910	36,001	68,266	144,991	122,781	57,228	1,923
ROADSIDE	11,800	449,749	827,800	603,464	664,427	929,323	732,637
SENECA STRIP	10,700	1,372,251	1,611,805	1,778,916	1,227,945	1,313,711	1,220,825
SOMERSET	12,500	650,210	900,777	854,697	668,622	453,409	596,020
SUNLIGHT	12,610	487	471	884	989	1,218	
THOMPSON CREEK NO 1	13,004	15,733	18,900	40,596	115,185	97,553	13,880
THOMPSON CREEK NO 3	13,760	18,207	14,000	1,812	4,469	11,736	
TOMAHAWK	10,000	35,231	70,741	24,076	101,336	41,915	
TRAPPER	9,800	1,332,985	2,328,700	2,014,376	2,093,012	2,001,106	2,304,274
TRINIDAD BASIN	13,000				65,039	71,739	73,908
TWIN PINES	10,500	36,691	37,124	34,872	22,099		
VIKING	13,012	16,342	49,682	23,515	37,014	1,858	
WILLIAMS FORK	9,800	242,097	42,900				
TOTAL		14,306,880	18,127,799	18,938,783	19,335,854	18,479,113	16,741,060
WEIGHTED AVG. (BTU/LB)		11,242	11,158	11,149	11,193	11,097	11,033

TABLE 4-13 AVERAGE PRICE, HEATING VALUE AND COST PER MILLION BTU'S OF COLORADO COAL

Year	Average Price of Colorado Coal ($/t)	Average Heating Value of Colorado Coal (Btu/lb)	Average Cost Per Million Btu's ($)
1978	17.37	11,242	0.7725
1979	16.72	11,158	0.7492
1980	19.89	11,149	0.8920
1981	21.38	11,193	0.9551
1982	22.48	11,097	1.0129
1983 (Est.)	22.75	11,033	1.0310

TABLE 4-14 AVERAGE INCREASE IN F.O.B. COST OF COLORADO COAL AND INTERSTATE RAIL RATES

Year	Average Price of Colorado Coal ($/t)	Interstate Rail Cost (1978=$10.00) ($/t)	Delivered Cost Per Ton ($/t)	Delivered Cost Per Million Btu's ($)
1978	17.37	10.00	27.37	1.2173
1979	16.72	11.13	27.85	1.2480
1980	19.89	12.63	32.52	1.4584
1981	21.38	15.29	36.67	1.6381
1982	22.48	16.86	39.34	1.7726
1983 (Est.)	22.75	17.83	40.58	1.8390

TABLE 4-15 AVERAGE INCREASE IN F.O.B. COST OF COLORADO COAL AND INTRASTATE RAIL RATES

Year	Average Price of Colorado Coal ($/t)	Intrastate Rail Cost (1978=$10.00) ($/t)	Delivered Cost Per Ton ($/t)	Delivered Cost Per Million Btu's ($)
1978	17.37	10.00	27.37	1.2173
1979	16.72	10.92	27.64	1.2386
1980	19.89	11.89	31.78	1.4252
1981	21.38	13.90	35.28	1.5760
1982	22.48	19.67	42.15	1.8992
1983 (Est.)	22.75	19.91	42.66	1.9333

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