Coal mining in the U.S. West: price and employment trends

Demand for low-sulfur western coal has led to rising coal prices in the West; employment in coal mining was stable in the region, in contrast to declining employment in much of the rest of the country

David McDermott

Coal produced in the Western[1] States has increased in price relative to coal from other regions of the Nation. At the same time, employment in coal mining has been virtually unchanged in the Western States, while it has declined in most other parts of the country. Appalachia is still the country's largest coal producer and employer, but a clear westward shift of coal mining is underway. Much of both the increased price for western coal and the stability of employment in western coal mining results from the low sulfur content of the area's coal, which has increased its desirability, environmentally speaking.

Legislative initiatives, including the New Source Performance Standards of 1971[2] and the Clean Air Act Amendments of 1990,[3] created incentives for electric utilities to burn low-sulfur coal. The Nation's largest source of such coal is in the West: the Powder River Basin of Wyoming.[4] While other factors (relative freight costs, labor costs, production costs, regional variation in demand for electricity, competing energy sources) undoubtedly contribute to both the increase in prices received by western coal mines and the stability of mining employment in some Western States, much of the impact can be attributed to the demand for coal with low sulfur content.

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Coal quality

About 86 percent of the coal mined in the United States is steam electric coal—that is, coal burned to produce steam to generate electricity. Legislation to preserve air quality has had significant impacts on the kind of coal that is burned and the kind of pollution control equipment electric utilities have installed. Much of this legislation has focused on the output of sulfur dioxide, a known cause of acid rain and respiratory problems in humans. Most of the legislation pertains only to new sources—power plants developed after the legislation goes into effect. Therefore, the economic impact of the legislation may not appear until many years after the new laws are passed.

Two of the three major air-quality legislative initiatives in recent decades have created incentives for electric utilities to reduce sulfur dioxide emissions by burning coal with a low sulfur content. The Environmental Protection Agency's New Source Performance Standards of 1971 set strict limits on emissions of sulfur dioxide from new electric power plants. These limits required new power plants either to burn coal with an average sulfur content of 1.2 pounds per million Btu's of heat output or to install expensive flue gas scrubbers. The 1971 Act is credited with causing many utilities—particularly in the Mid-

west—to switch from locally mined coal to low-sulfur coal from the Powder River Basin. In 1979, the Revised New Source Performance Standards changed the incentive structure established by the former standards, actually reducing companies' incentives to burn low-sulfur coal. The new regulations increased incentives for new plants to use scrubbers, reducing utilities' dependence on low-sulfur coal as a means of limiting sulfur dioxide emissions.

Finally, the Clean Air Act Amendments of 1990 were intended to provide utilities with increased flexibility in meeting standards for sulfur dioxide output, including burning coal of moderate sulfur content along with low-sulfur coal, cleaning coal prior to burning it, and buying emissions allowances to make up the additional sulfur output. Physical cleaning of coal can reduce both sulfur emissions and emissions of other chemicals. The purchase of emissions allowances gives utilities alternatives to installing scrubbers. A utility with a plentiful supply of moderate-sulfur coal can comply with the Act by burning some low-sulfur coal and then buying allowances to make up the difference between its actual emissions and the emission levels required by the Act.

The largest U.S. reserves of low-sulfur coal (defined by the Energy Information Administration as having less than 0.6 pound of sulfur per million Btu's) are located in the West. (See chart 1.) Montana leads the Nation with more than 50 billion short tons of low-sulfur coal. Wyoming has reserves of just under 25 billion short tons with similar sulfur content. The largest reserves of low-sulfur coal in the eastern half of the country are in West Virginia, which has reserves of less than 10 billion short tons. (See chart 2.)

Coal price changes from the PPI

The PPI measures average changes in prices received by domestic producers of commodities in all stages of processing. The index reports changes in actual prices for a constant sample of goods, services, and transactions. When a product, service, or transaction changes, the PPI attempts to make a quality adjustment to ensure that only true price changes are reflected in the published indexes. While the data necessary to make these adjustments are not always available, the quality adjustment process allows meaningful comparisons to be made over time, with reduced distortion from changes in various characteristics of the item—for example, sulfur content and heat value in the case of coal.[5]

Since 1983, the PPI has shown declines in prices received by coal producers in every region of the country except the West. (See table 1.) Prices for coal used for generating electricity declined 11.7 percent in Southern Appalachia, 10.6 percent in the Midwest, and 5.1 percent in Northern Appala-

Chart 1. Coal-producing States in Bureau of Mines districts, and reserves of coal of less than 0.6 pounds of sulfur per million BTU (values in billions of tons).

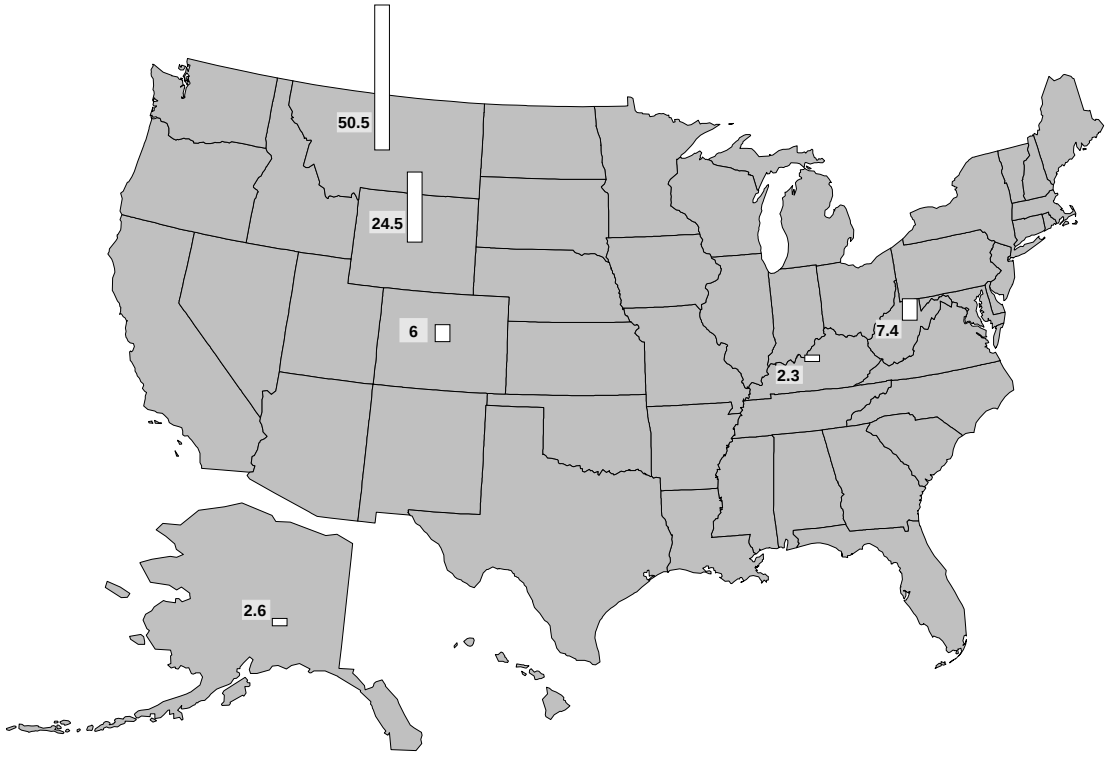
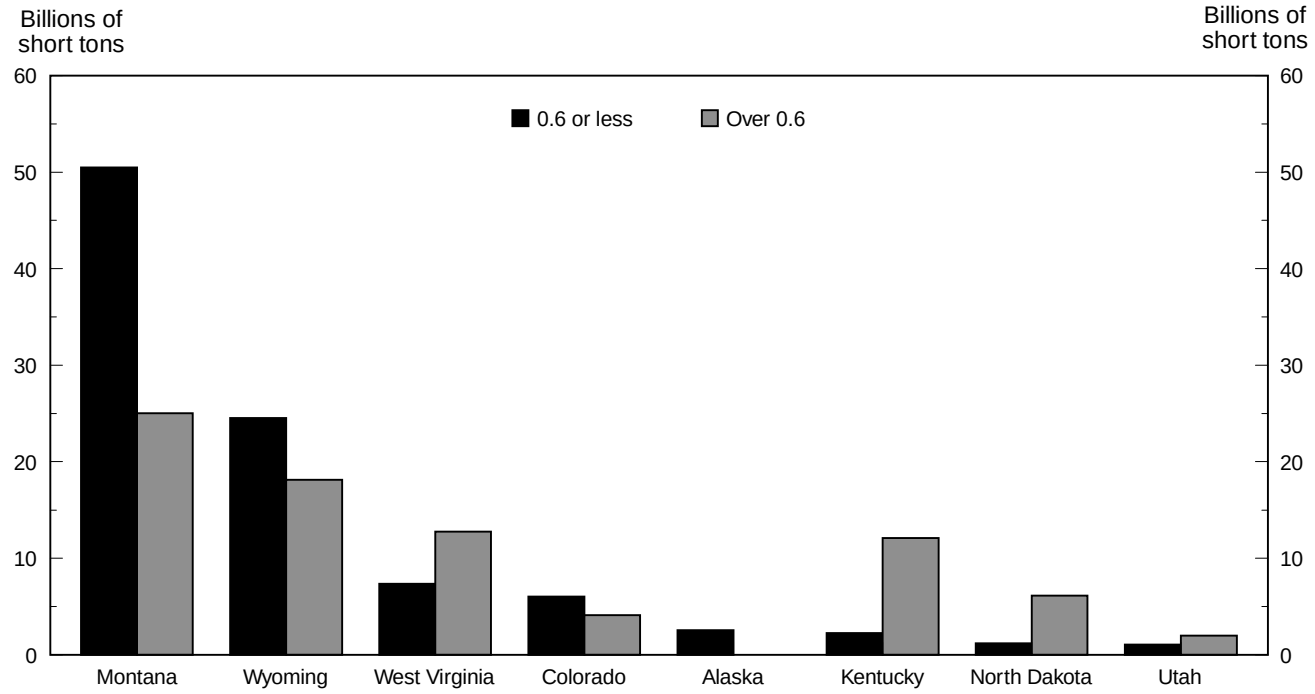


Chart 2. Recoverable reserves of coal by sulfur content, 1992



chia. In the West, where the largest deposits of low-sulfur coal are located, prices received by coal producers increased 11.6 percent. This divergence is depicted quite dramatically in chart 3. The change in prices received by coal producers in all regions is below the 57.5-percent overall rate of consumer price inflation for the period, but producers in the West enjoyed significantly more favorable price changes relative to producers in other parts of the country.

Coal prices vary dramatically from State to State. In 1990, average minemouth[6] prices ranged from less than $8.00 per ton in North Dakota to more than $40.00 per ton in Alabama. These data are not adjusted for differences in quality between different districts.

Output and employment changes

Coal production in the Western States increased at an average annual rate of 5.5 percent from 1986 to 1995. The rate of growth in the West was more than 3 times the national rate. Over the same period, Appalachian coal output grew at a modest 0.2 percent per year, and the coal output of the interior States declined 1.7 percent annually.[7]

Employment in coal mining was virtually unchanged from 1988 to 1996 in States in the regions that produce low-sulfur coal. Among the 10 States reporting data,[8] employment in coal mining declined in the East and held nearly steady in the West. (See table 2 and chart 4.) Kentucky lost 12,400 coal-mining jobs, Pennsylvania lost 8,600, and West Virginia lost 8,300. Ohio lost 3,900 jobs, or 50 percent of its coal-mining employment, as consumers substituted low-sulfur western coal for high-sulfur eastern coal. In all the Western States,

Table 1. Producer Price Indexes for steam electric coal, percent change from 1983 annual average, by region, 1984–96

[In percent]

Year	North Appalachia	South Appalachia	Midwest	West
1984	5.1	1.8	1.6	3.6
1985	4.2	1.7	2.7	3.9
1986	2.2	.2	.3	4.8
1987	–.6	–1.5	–3.7	4.7
1988	–3.4	–.5	–5.5	3.0
1989	–4.8	–.8	–7.6	3.5
1990	–.5	1.2	–7.1	5.8
1991	–.5	–3.4	–6.5	8.1
1992	–1.2	–6.5	–6.5	6.2
1993	–4.2	–8.1	–6.3	7.2
1994	–4.0	–8.2	–5.1	6.9
1995	–5.8	–10.8	–8.9	8.1
1996	–5.1	–11.7	–10.6	11.6

Chart 3. **Producer Price indexes for steam electric coal, percent change from 1983 annual average, by region, 1984–96**

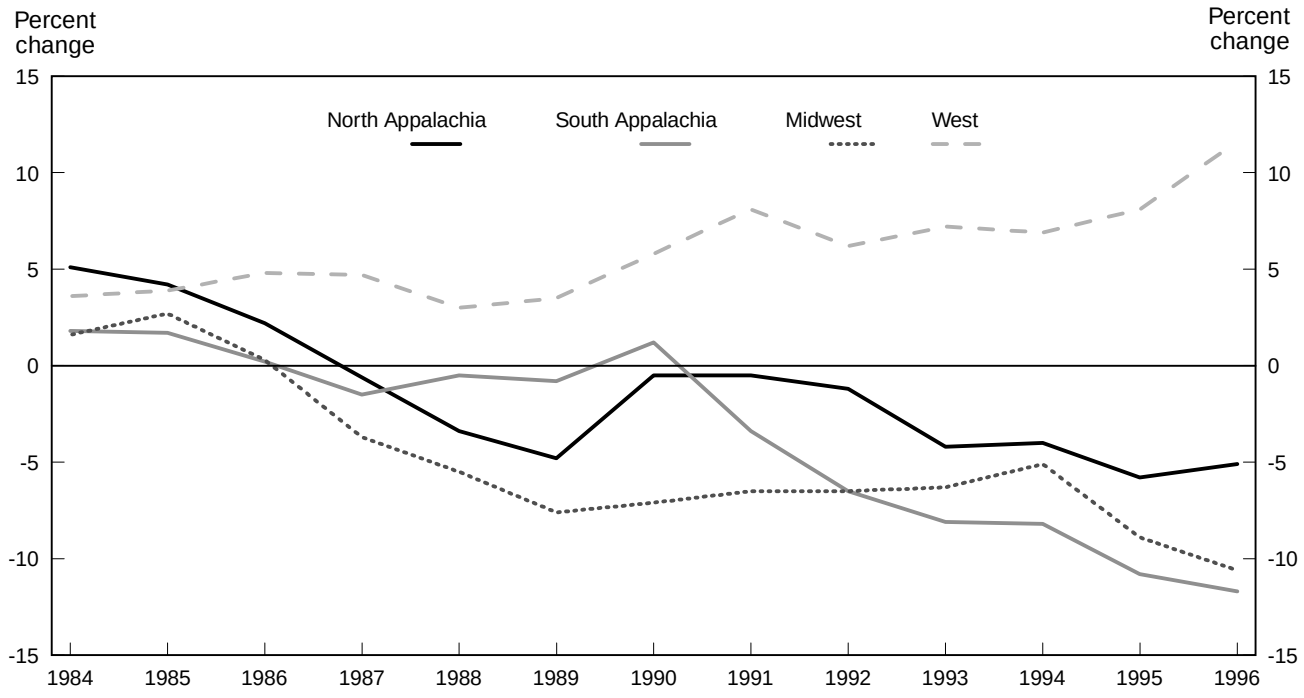
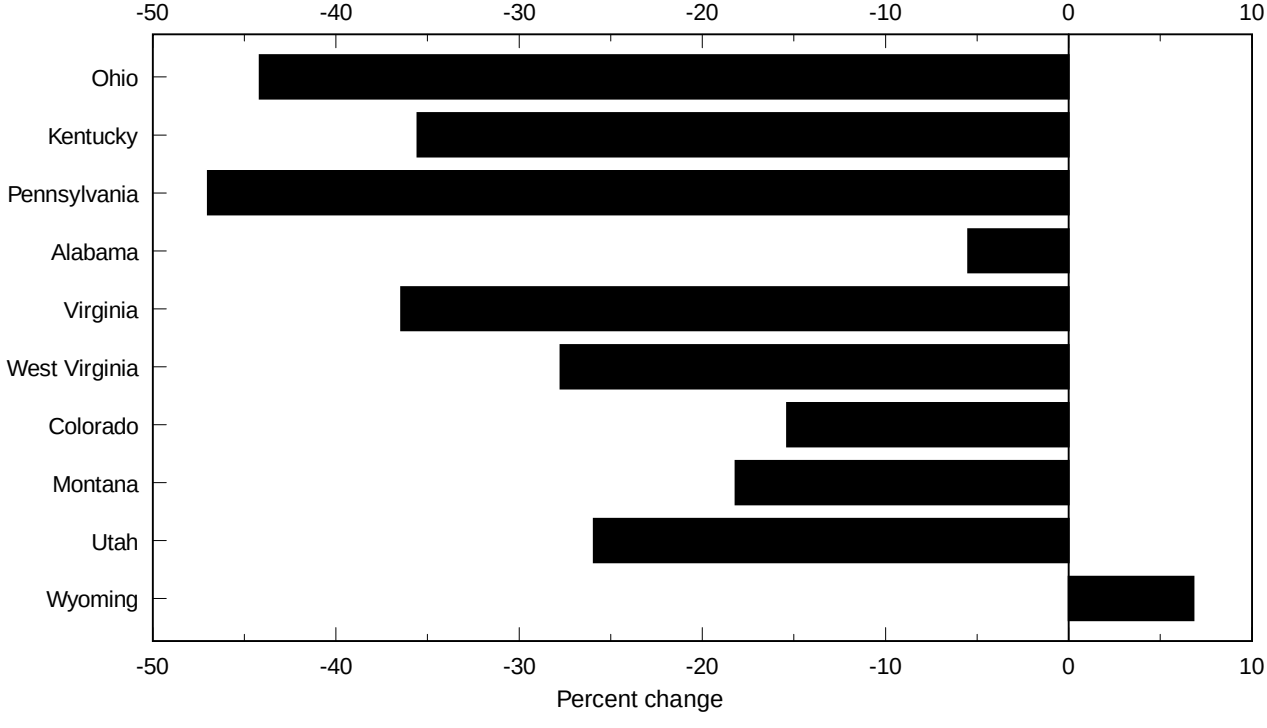


Chart 4. **Percent change in coal mining employment, selected States, 1988–96**



employment in coal mining was relatively stable, with each State reporting gains or losses generally too small to be statistically significant or even discernible.

Western coal is typically mined from large surface mines, allowing the use of gigantic excavating and coal-loading equipment. As a result, output per miner per hour at western mines is more than 3 times higher than the national average of 3.83 short tons per miner per hour. Output per hour in Wyoming is 21.41 short tons per miner per hour, more than 5 times the national average.[9] The relatively small labor input per unit of output at western mines permits output to be increased without large increases in employment. This in turn, reduces the impact of labor cost increases on total production costs, suggesting that labor cost increases would have had little impact on price increases for western coal.

Table 3. Producer Price Indexes, rail transportation of bituminous coal, annual averages, 1983–96

[December 1984 = 100]

Year	Index	Cumulative percent change
1983	96.5	
1984	99.9	3.5
1985	100.0	3.6
1986	100.7	4.4
1987	100.1	3.7
1988	104.3	8.1
1989	105.3	9.1
1990	104.2	8.0
1991	105.2	9.0
1992	105.9	9.7
1993	106.6	10.5
1994	107.5	11.4
1995	107.3	11.2
1996	106.7	10.6

Other economic factors

In addition to increased demand resulting from the conversion of power plants to the production of low-sulfur coal, other factors are likely to have contributed to increased prices for western coal relative to coal prices in the rest of the Nation.

Economic growth has been strong in the West, leading to an increase in the region's demand for electricity. The population in Western States grew almost 30 percent faster than the national rate at the same time that western coal prices were rising relative to those of the rest of the Nation.[10] Electric utilities in the Mountain States increased their consumption of coal more than 500 percent from 1970 to 1990 and increased their share of total coal consumption from 4.6 percent to 13.0 percent.[11] Both the population growth and the increase in electricity production in the West could create upward pressures on prices for western coal.

Table 2. Annual average employment in SIC 12, coal mining, for all States for which data are available, 1988 and 1996

[Numbers in thousands]

Region and State	1988	1996	Change	Percent Change
North Appalachia:				
Pennsylvania	19.7	11.1	–8.6	–43.7
Ohio	7.8	3.9	–3.9	–50.0
South Appalachia:				
Virginia[1]	11.3	6.9	–4.4	–38.9
West Virginia	29.4	21.1	–8.3	–28.2
Kentucky	31.6	19.2	–12.4	–39.2
Alabama	7.3	6.5	–.8	–11.0
West:				
Colorado	2.7	2.2	–.5	–18.5
Montana[1]	1.1	.9	–.2	–18.2
Utah:	2.6	2.1	–.5	–19.2
Wyoming	4.5	4.7	.2	4.4

[1]Data for 1988 not available; comparison begins with 1989.

Environmental regulation of coal production had varying impacts on coal-mining regions. The Coal Mining Health and Safety Act of 1969 increased production costs, particularly for underground mines, which are more common in Eastern States. The Surface Mining Control and Reclamation Act of 1977 increased the cost of surface mining, the typical method of production in Western States.

Finally, for western coal to make inroads into markets in the Midwest, transportation costs must be sufficiently low that the quality advantages of western coal are not offset by higher freight costs. Data from the Producer Price Index indicate that this is indeed the case. Rail freight rates for coal (more than two-thirds of western coal is shipped by rail) have increased only 10.6 percent from 1983 to 1996 (see table 3), considerably less than the 57.5-percent increase in the Consumer Price Index for All Urban Consumers and All Items over the same period.

Efforts to control air pollution from coal-fired power plants have created incentives for electric utilities to burn increasing amounts of coal from the Western States. In combination with low costs for production and transportation, as well as overall population growth in the West, these incentives have led to price increases for western coal and employment stability in western coal mining at a time that coal-mining employment has generally been in decline. Clearly, the Western States have benefited from reserves of low-sulfur coal, and their mines and processing facilities are poised to compete with those in other parts of the country. □

Footnotes

[1] Producer Price Index (PPI) data for coal are published by Bureau of Mines (BOM) districts. Coalbeds do not always respect State boundaries, so some districts cross State lines. The publication categories for PPI's and the approximate State equivalents are as follows: West (BOM 16–23)—Colorado, New Mexico, Arizona, California, Idaho, Wyoming, Utah, North Dakota, South Dakota, Montana, Alaska, Oregon, Washington; Midwest (BOM 9–12, 14, 15)—Oklahoma, Texas, Iowa, Illinois, Indiana, Arkansas, Kansas, Louisiana, Missouri; South Appalachia (BOM 7, 8, 13)—Virginia, West Virginia, Kentucky, Tennessee, Alabama, Georgia, North Carolina; North Appalachia (BOM 1–6)—Maryland, Pennsylvania, Ohio, Michigan.

[2] Bruce Ackerman and William Hassler, *Clean Coal/Dirty Air* (New Haven, CT, Yale University Press, 1981).

[3] *US Coal Reserves: An Update by Heat and Sulfur Content* (U.S. Department of Energy, Energy Information Administration, 1993).

[4] *The Changing Structure of the US Coal Industry* (U.S. Department of Energy, Energy Information Administration, 1993), pp. 27–28.

[5] In addition, the PPI collects both arms-length and intracompany transfer prices. Arms-length prices reflect transactions between independent buyers and sellers. Intracompany transfer prices are accounting prices between different divisions of a single business. Intracompany transfer prices are often found in coal mining, where many of the transactions occur between a mine and a power plant under common ownership.

[6] That is, prices at the mine before cleaning, preparation, or transportation.

[7] *Coal Industry Annual* (US Department of Energy, Energy Information Administration, 1995), p. 5.

[8] Not all States provide data on employment in coal mining as part of the Current Employment Statistics program. States have considerable latitude concerning which industries they choose to publish. Even States with large coal reserves may choose not to publish employment data for the coal mining industry, particularly if the industry contributes relatively little to statewide employment.

[9] *The US Coal Industry, 1970–1990: Two Decades of Change*, DOE/EIA–0559 (Washington, Energy Information Industry, November 1992), p. 83.

[10] "Intercensal Estimates of the Resident Population of States," tables available on-line at http://www.census.gov/population/estimate-extract/state/st8090.txt and http://www.census.gov/population/estimate-extract/state/strespop.txt (Bureau of the Census, Nov. 15, 1996).

[11] See *Minerals Yearbook, 1970* (Bureau of Mines, 1972), p. 377; and *Quarterly Coal Report, October–December 1991*, DOE/EIA–0121(91/4Q) (Energy Information Administration, May 1992), table 26, reproduced in *The US Coal Industry, 1970–1990*, p. 38. The data in all of the reports refer to the Mountain Census Division, which comprises Arizona, Colorado, Idaho, Montana, Nevada, New Mexico, Utah, and Wyoming.