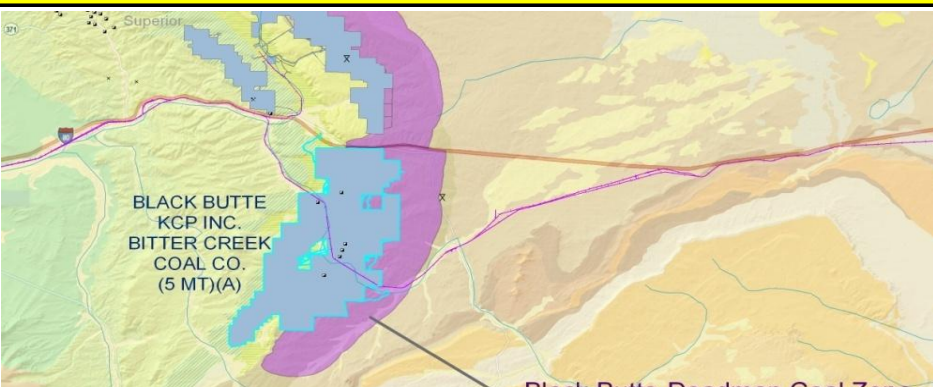
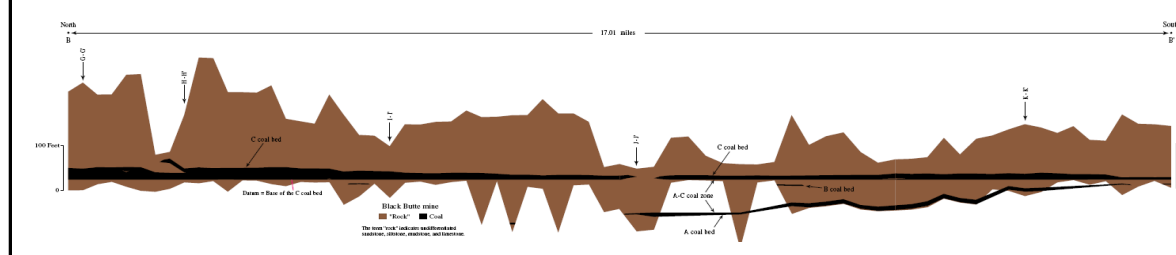
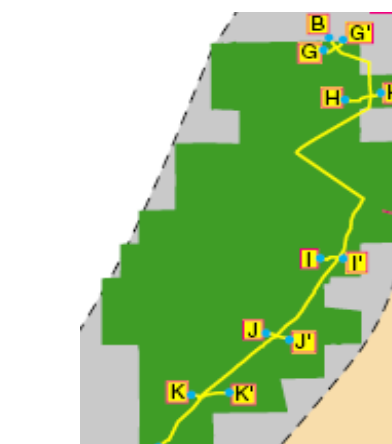
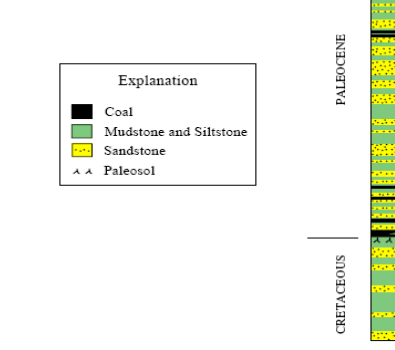

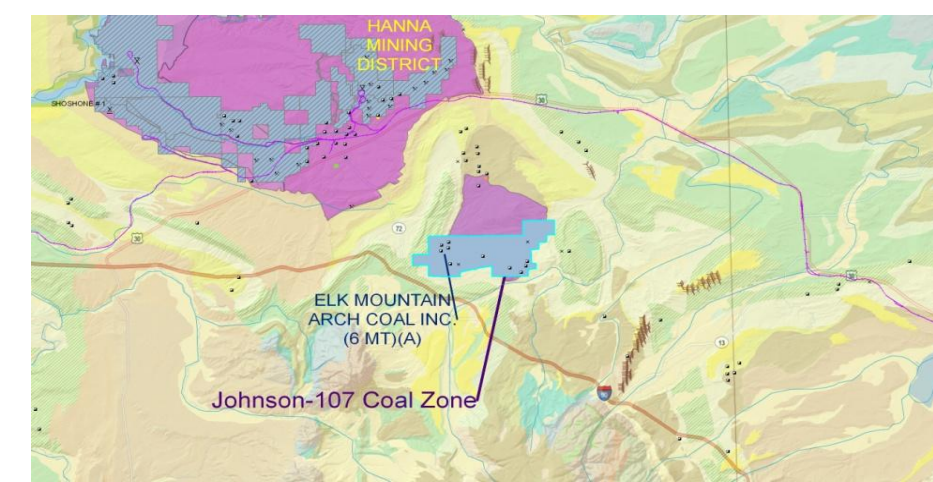
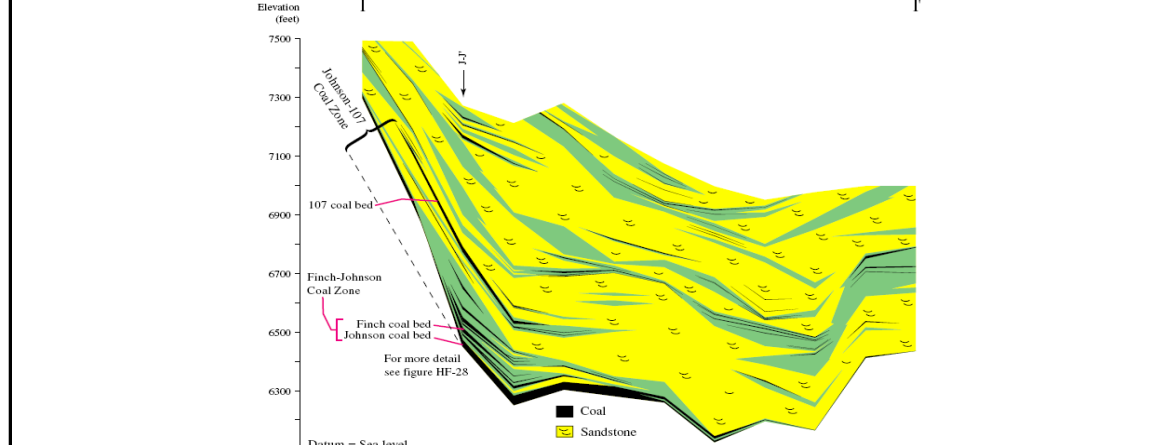
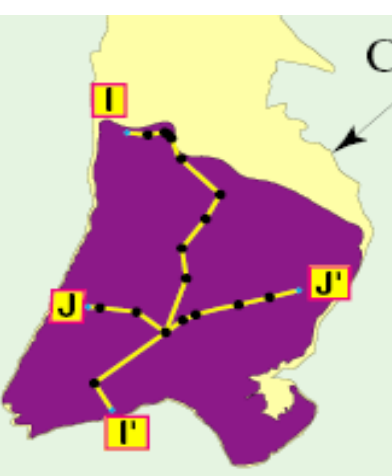
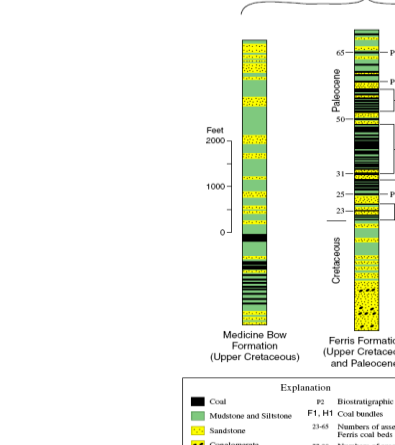

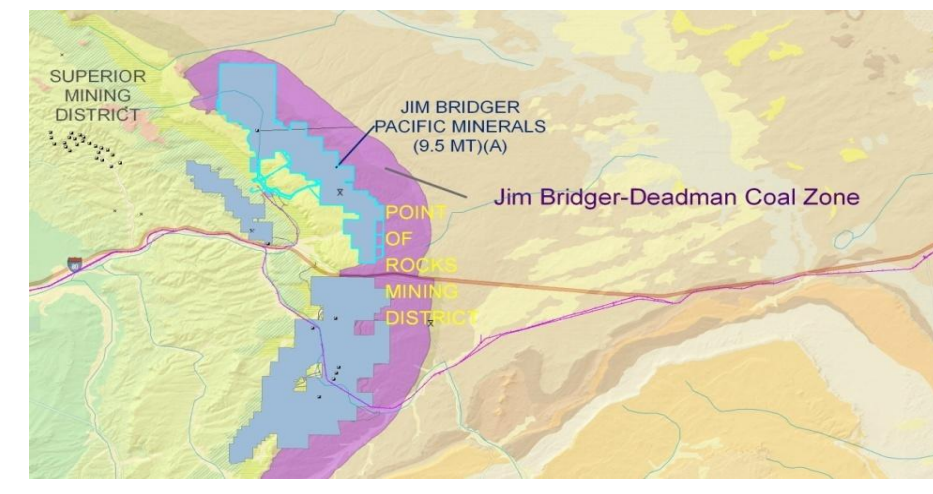
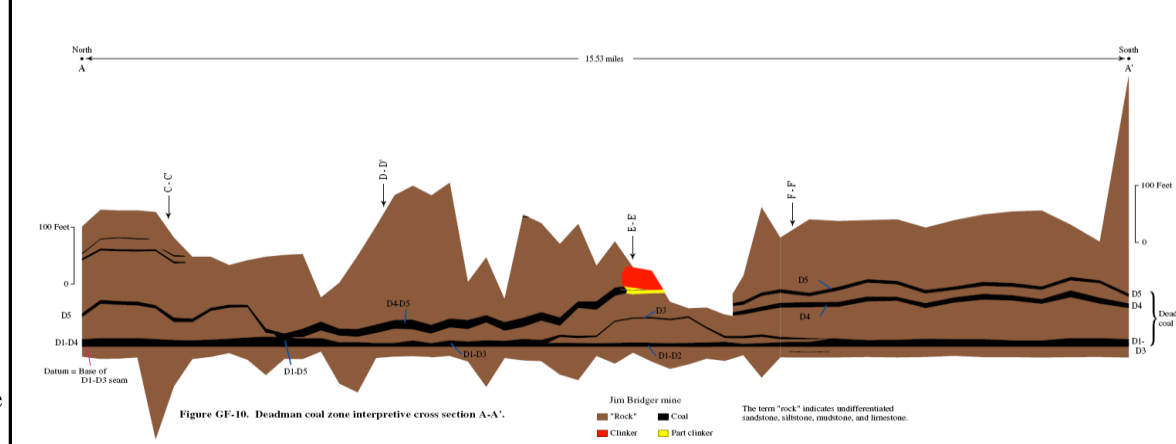
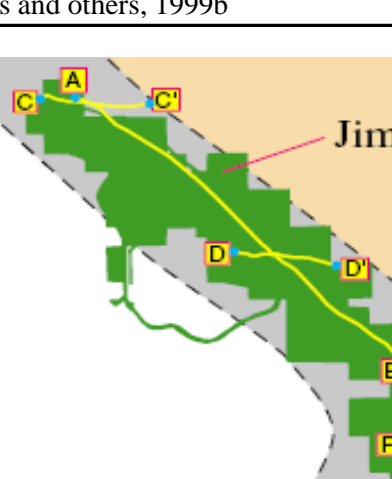
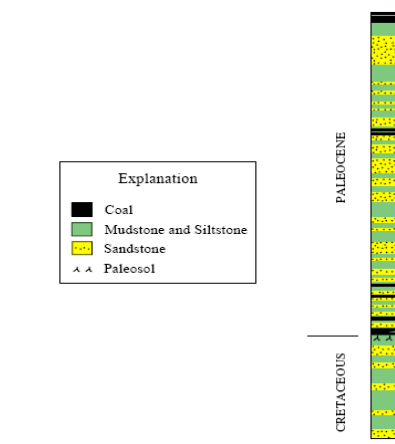
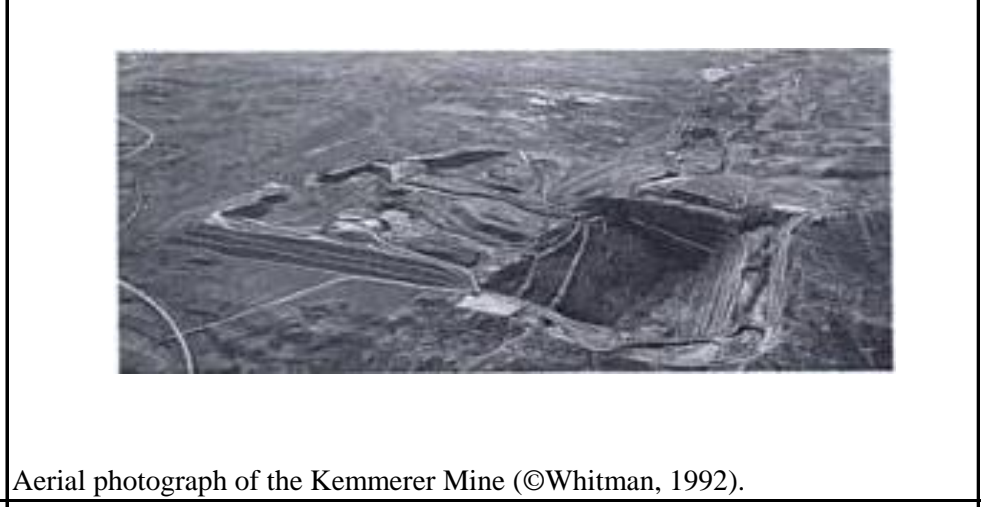
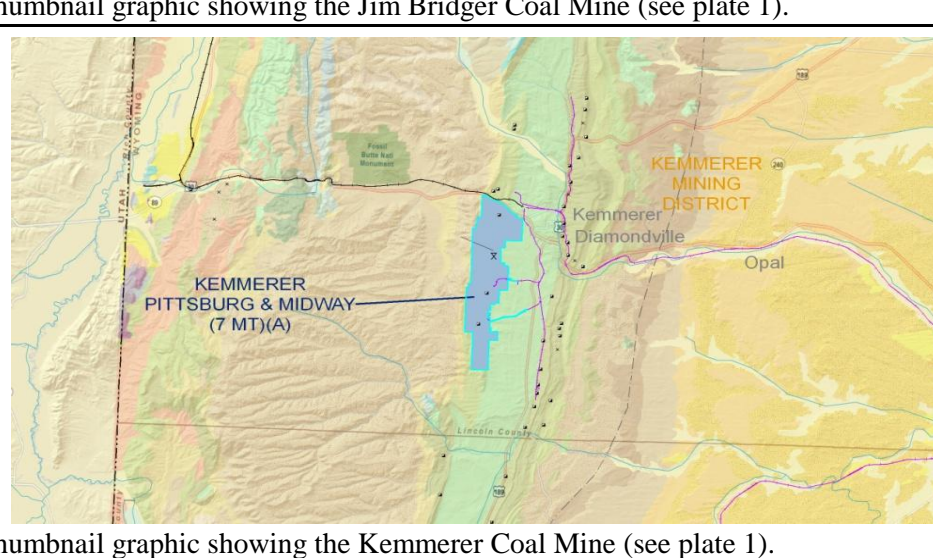
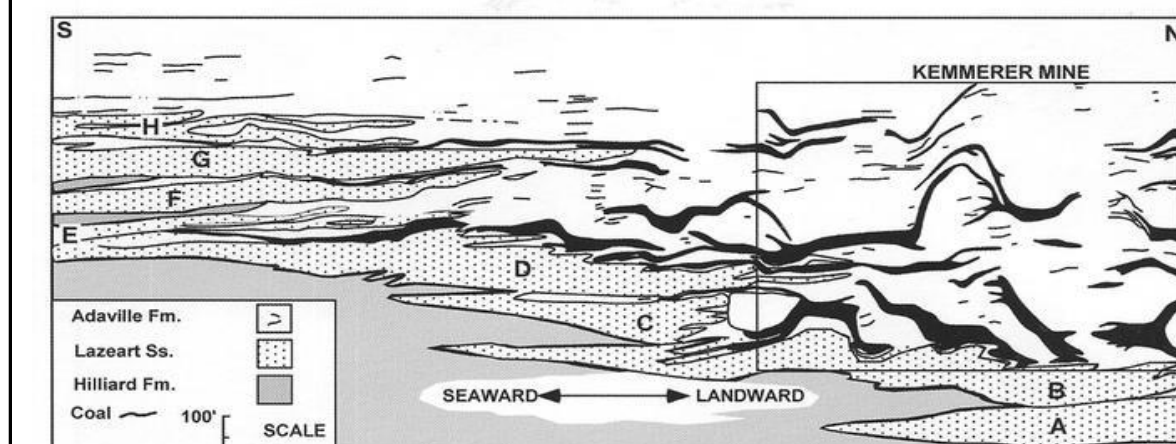

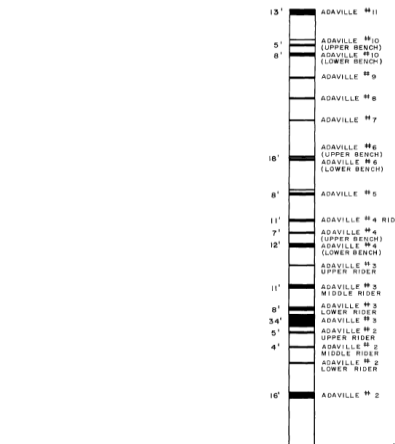
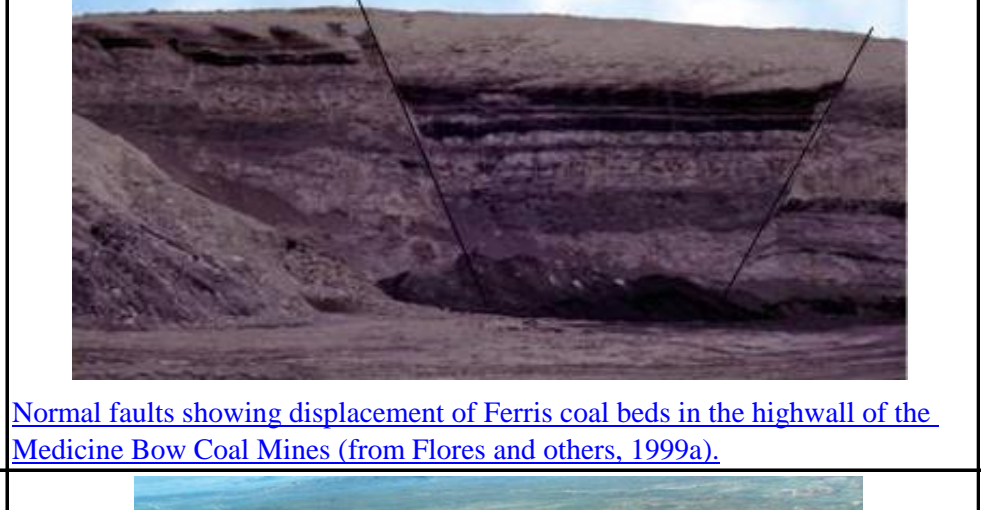
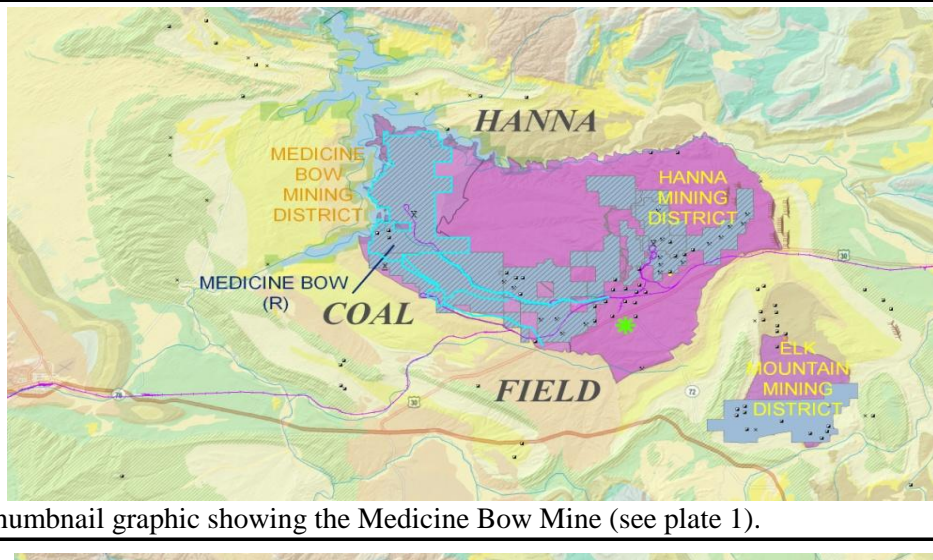
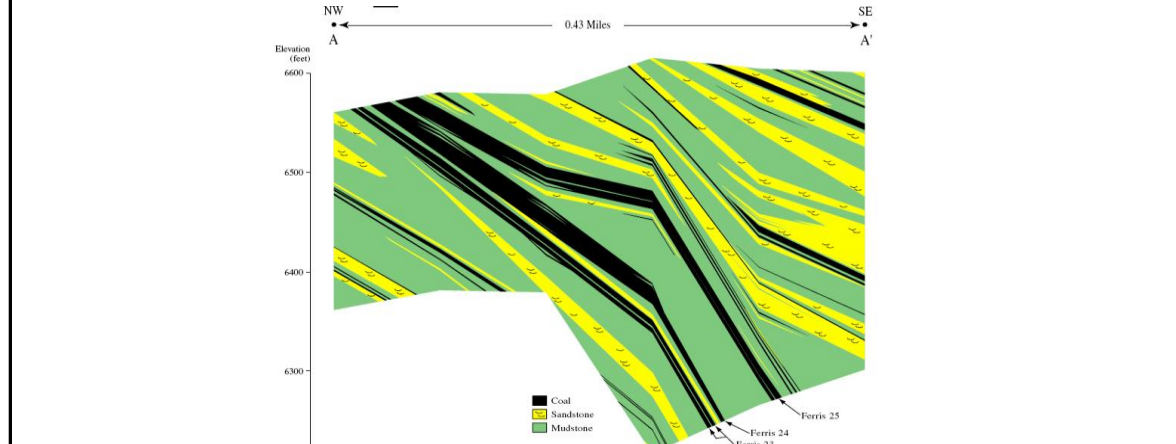
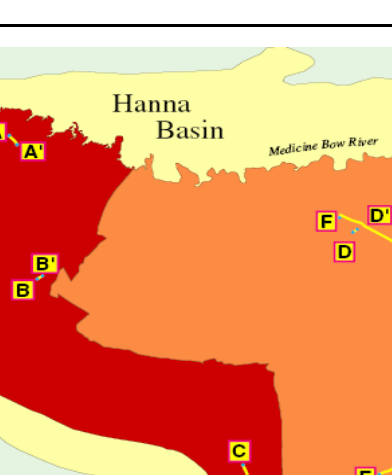
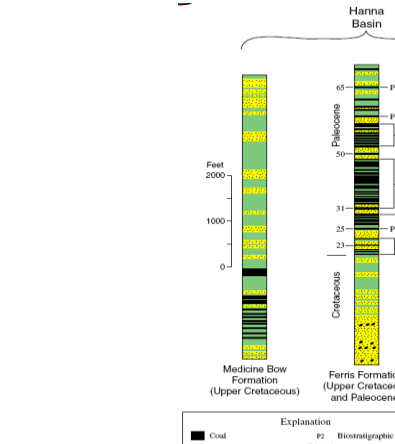
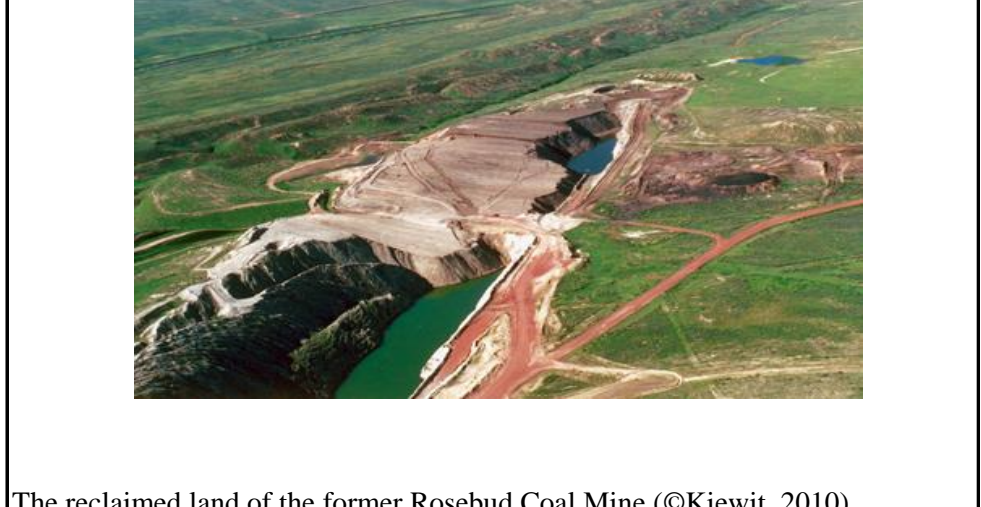
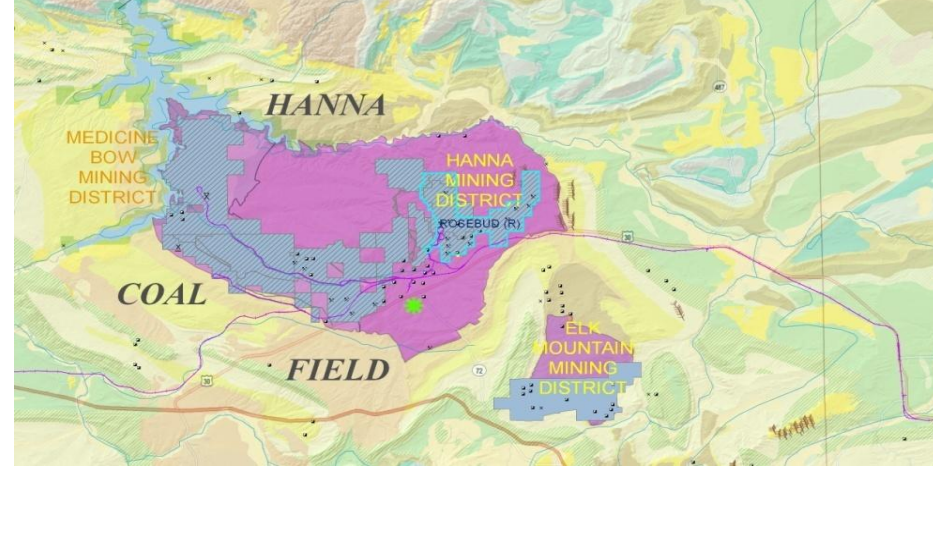
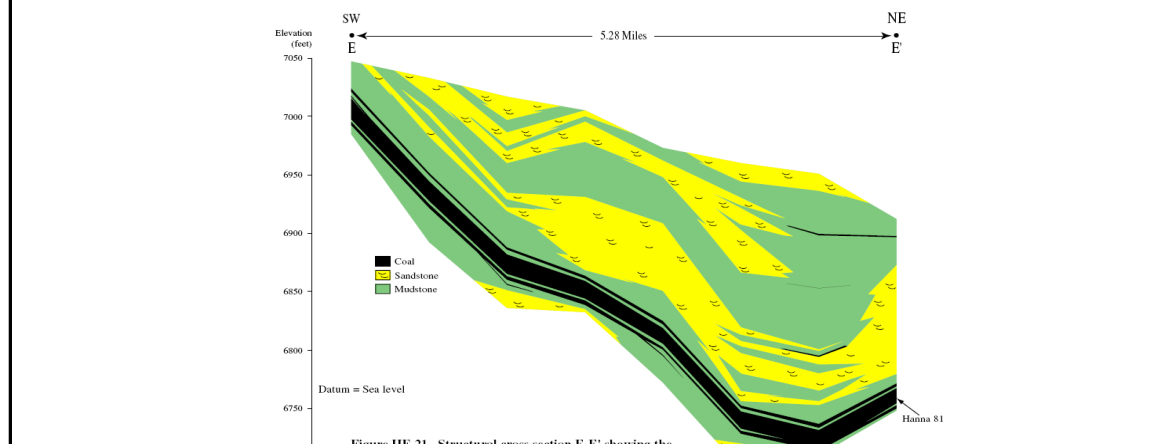
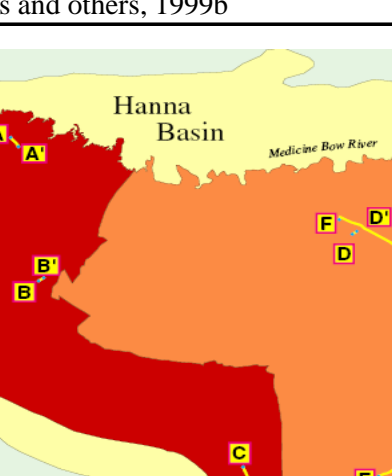


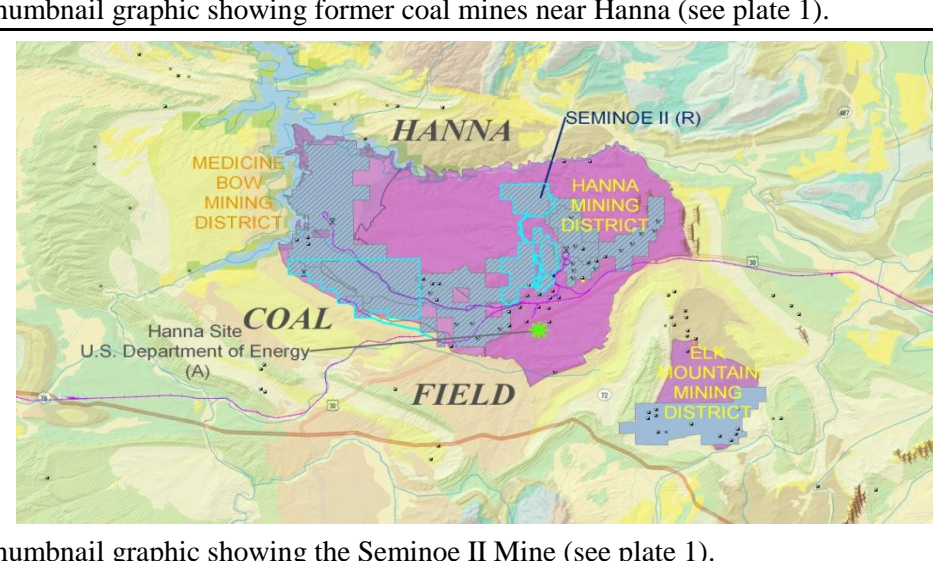
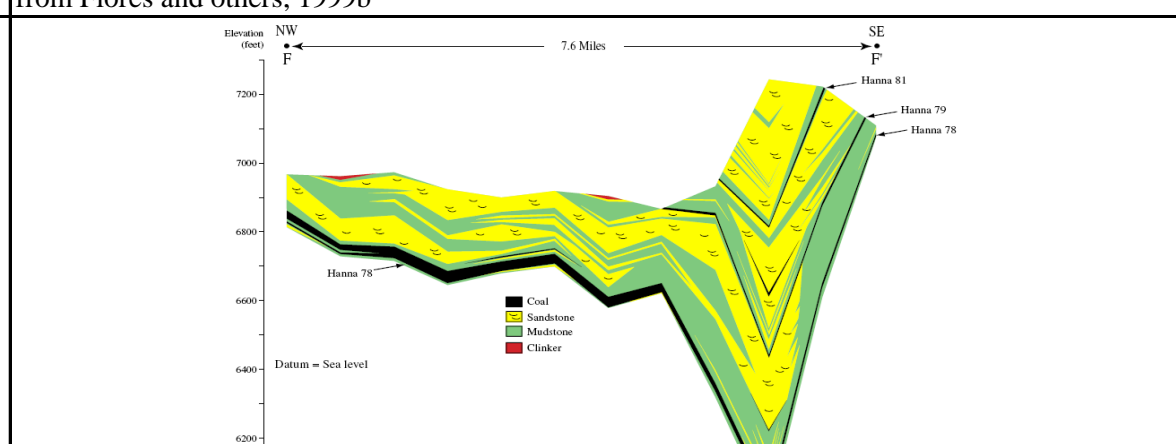
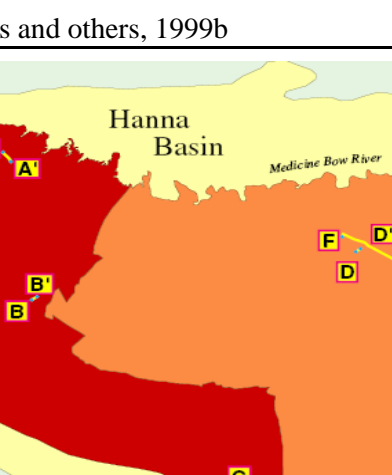


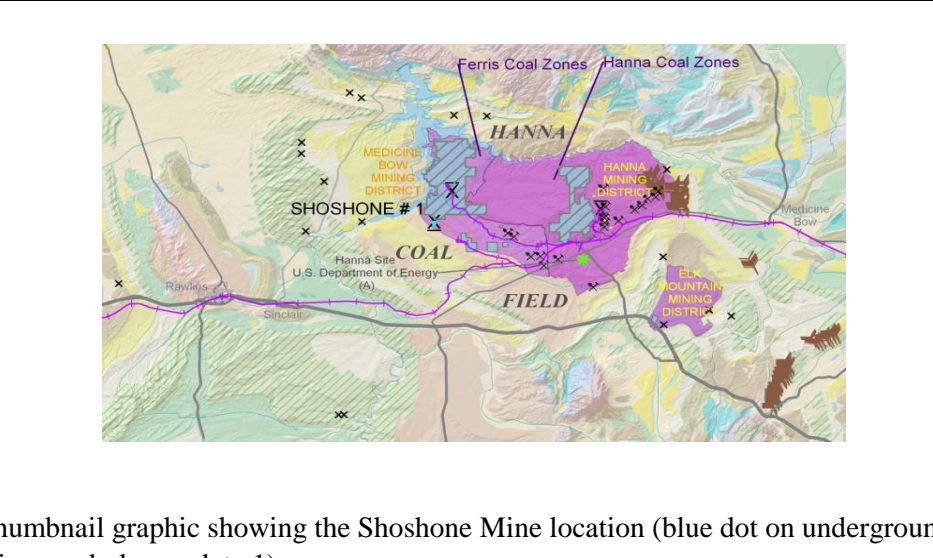




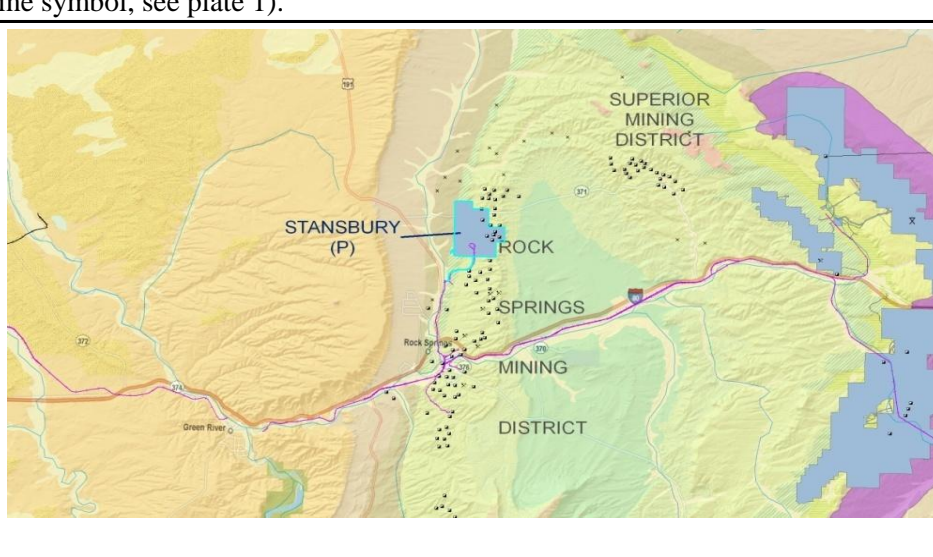
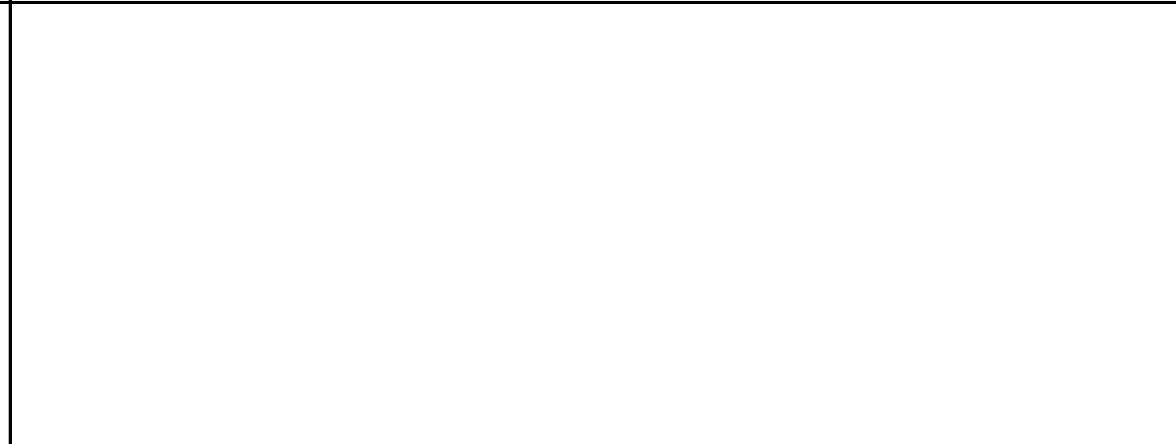





| Coal Mine | Coal Specifications | Company | Facilities | Formation | Cross Section | Cross Section Index Map | Stratigraphy | Location | Production | Reclamation | Status | Type | Photographs | | | | | | | | | | | | |
|--|--|---|---|---|--|---|---|---|---|-------------|------------------------------------|------|-------------|------|-----|------|-----|------|-----|--|--|--|--|--|---|
| Black Butte Mine |  Subbituminous C, 9,400–10,000 Btu/lb, 0.3–0.7 percent sulfur (©Union Pacific, 2010a) | Black Butte Coal Company (©Union Pacific, 2010a) | Coal plant, laboratory, water treatment plant, warehouse, shop, changehouse and office (©Kiewit, 2010) | Coal is produced from the Wasatch, Fort Union, Lance and Almond Formations. In the lower part of the Fort Union Formation, the A, B, and C coal beds or the A–C coal zone in the Black Butte Mine is laterally equivalent to the Deadman coal zone in the Jim Bridger Mine (Maywood, 1987). |  |  |  | Point of Rocks, Wyoming (©Union Pacific, 2010a) | <table><tr><th>Year</th><th>Coal Tonnage (million short tons)</th></tr><tr><td>2009</td><td>3.8</td></tr><tr><td>2008</td><td>3.6</td></tr><tr><td>2007</td><td>3.6</td></tr><tr><td>2006</td><td>3.4</td></tr><tr><td>2005</td><td>3.7</td></tr></table> (U.S. Department of Labor, 2011, and Wyoming Department of Environmental Quality, 2011). | Year | Coal Tonnage (million short tons) | 2009 | 3.8 | 2008 | 3.6 | 2007 | 3.6 | 2006 | 3.4 | 2005 | 3.7 | At all presently active surface mines, as mining progresses, overburden is placed in a previous cut, where it is graded to the natural topography and covered with topsoil. Regraded land is fertilized, mulched and seeded with native grasses and bushes for livestock grazing and wildlife habitat (©Kiewit, 2010). | Began shipping coal in 1979, and is still active (©Union Pacific, 2010a). | Black Butte Coal Company operates one of the largest surface coal mines in the nation (©Kiewit, 2010). |  |
| Year | Coal Tonnage (million short tons) | | | | | | | | | | | | | | | | | | | | | | | | |
| 2009 | 3.8 | | | | | | | | | | | | | | | | | | | | | | | | |
| 2008 | 3.6 | | | | | | | | | | | | | | | | | | | | | | | | |
| 2007 | 3.6 | | | | | | | | | | | | | | | | | | | | | | | | |
| 2006 | 3.4 | | | | | | | | | | | | | | | | | | | | | | | | |
| 2005 | 3.7 | | | | | | | | | | | | | | | | | | | | | | | | |
| Elk Mountain Mine |  10,930 Btu/lb, 0.7 lbs. SO ₂ /mmBtu (©Arch Coal, 2010) | Arch Coal | Active surface mine. Proposed mine-mouth Coal-to-Liquids facility. | Paleocene Hanna Formation |  |  |  | Carbon County, Wyoming | <table><tr><th>Year</th><th>Coal Tonnage (thousand short tons)</th></tr><tr><td>2009</td><td>7</td></tr><tr><td>2008</td><td>261</td></tr><tr><td>2007</td><td>120</td></tr><tr><td>2006</td><td>28</td></tr></table> (U.S. Department of Labor, 2011, and Wyoming Department of Environmental Quality, 2011). | Year | Coal Tonnage (thousand short tons) | 2009 | 7 | 2008 | 261 | 2007 | 120 | 2006 | 28 | See above. Reclamation coincides with mining. | Idle surface mine currently reducing inventory. Arch Coal will continue the surface mine and expand to include an underground operation when coal markets, such as a coal-to-liquid plant, materialize (Arch Coal, 2012, written communication). Arch Coal has acquired an additional 200 million-ton reserve block that will be available for future mining operations (©Union Pacific, 2010d). | One surface mine with plans to shift operations to underground (©Arch Coal, 2010). | Elk Mountain Mine (from World Imagery GIS service, ESRI, 2010). |  | |
| Year | Coal Tonnage (thousand short tons) | | | | | | | | | | | | | | | | | | | | | | | | |
| 2009 | 7 | | | | | | | | | | | | | | | | | | | | | | | | |
| 2008 | 261 | | | | | | | | | | | | | | | | | | | | | | | | |
| 2007 | 120 | | | | | | | | | | | | | | | | | | | | | | | | |
| 2006 | 28 | | | | | | | | | | | | | | | | | | | | | | | | |
| Jim Bridger Mine |  Coal rank is mainly subbituminous B to C (Glass, 1976). | Bridger Coal is a joint business venture. Pacific Minerals, Inc. has two-thirds ownership, and Idaho Energy Resources, Co. has the other third (©Gearino-Star-Tribune, 2010). | The mine provides the adjacent Jim Bridger Power Plant with a continuing fuel source. The four-unit, 2,100-megawatt generating station produces electricity for PacificCorp and Idaho Power, customers in six Western states. (©Gearino-Star-Tribune, 2010). | There are five coal seams within the Deadman coal zone of the Jim Bridger coal field, designated, from top to bottom, D5 through D1 (Vetter and Beam, 1999). The Deadman coal zone is in the lower part of the Fort Union Formation. |  |  |  | Just north of Interstate 80, about 35 miles northeast of Rock Springs. (©Gearino-Star-Tribune, 2010). | <table><tr><th>Year</th><th>Coal Tonnage (million short tons)</th></tr><tr><td>2009</td><td>5.6</td></tr><tr><td>2008</td><td>7</td></tr><tr><td>2007</td><td>8</td></tr><tr><td>2006</td><td>7.6</td></tr></table> (U.S. Department of Labor, 2011, and Wyoming Department of Environmental Quality, 2011). | Year | Coal Tonnage (million short tons) | 2009 | 5.6 | 2008 | 7 | 2007 | 8 | 2006 | 7.6 | Produces from underground, surface, and highwall combined. See above. Research projects have been initiated in the past to assess establishment of a predominantly native, diverse seed mix under irrigation, as well as to determine irrigation rates and duration (Parady, 1985). | In 2007, the mining operation was expanded to include a new underground coal mine that mines a deeper coal seam. The additional coal will be used to fuel the power plant for another 20 years. The estimated cost for transitioning to the underground mine was approximately \$150 million (©Gearino-Star-Tribune, 2010). | The mine employs three methods of mining – traditional surface, where the coal is less than 300 feet deep, highwall mining, which is the unmined face of exposed coal from the surface mine, and underground mining. (©Gearino-Star-Tribune, 2010). | Highwall miner at Jim Bridger Coal Mine (used with permission from OAdcar, 2010). | Jim Bridger Power Plant (used with permission from Jeff Hymas, 2012, ©PacifiCorp). |  |
| Year | Coal Tonnage (million short tons) | | | | | | | | | | | | | | | | | | | | | | | | |
| 2009 | 5.6 | | | | | | | | | | | | | | | | | | | | | | | | |
| 2008 | 7 | | | | | | | | | | | | | | | | | | | | | | | | |
| 2007 | 8 | | | | | | | | | | | | | | | | | | | | | | | | |
| 2006 | 7.6 | | | | | | | | | | | | | | | | | | | | | | | | |
| Kemmerer Mine |  9,500–10,000 Btu/lb, 0.6–1.0 percent sulfur (©Union Pacific, 2010b); subbituminous B (Ym and others, 1987). | Chevron Mining | Naughton Power Plant is located near Kemmerer, Wyo. | Coal is produced from multiple coal seams in the Adelaide Formation that dip from 17 to 23 degrees. (©Union Pacific, 2010b). |  |  |  | Lincoln County, Wyoming | <table><tr><th>Year</th><th>Coal Tonnage (million short tons)</th></tr><tr><td>2009</td><td>4.4</td></tr><tr><td>2008</td><td>4.9</td></tr><tr><td>2007</td><td>5.2</td></tr><tr><td>2006</td><td>4.5</td></tr></table> (U.S. Department of Labor, 2011, and Wyoming Department of Environmental Quality, 2011). Current annual production capacity 4.8 million short tons. (©Union Pacific, 2010b). | Year | Coal Tonnage (million short tons) | 2009 | 4.4 | 2008 | 4.9 | 2007 | 5.2 | 2006 | 4.5 | See above. Allowing total out-of-pit spoil and minimum in-pit reclamation while mining steeply dipping bituminous coal, the I-UD area is permitted as a special bituminous operation (Whitman, 1992). | The Big Pit was begun in 1971 and is presently idle. In January 2011, Chevron Corporation, announced their intent to sell their remaining coal mining operations, including the Kemmerer Mine (©Chevron, 2011). Chevron Mining spokeswoman said new coal technologies are too far off to make staying in coal a good strategy (©MarketWatch, 2011). | Surface mine. | Aerial photograph of the Kemmerer Mine (©Whitman, 1992). | Naughton power plant near Kemmerer (photo taken July 14, 2011). |  |
| Year | Coal Tonnage (million short tons) | | | | | | | | | | | | | | | | | | | | | | | | |
| 2009 | 4.4 | | | | | | | | | | | | | | | | | | | | | | | | |
| 2008 | 4.9 | | | | | | | | | | | | | | | | | | | | | | | | |
| 2007 | 5.2 | | | | | | | | | | | | | | | | | | | | | | | | |
| 2006 | 4.5 | | | | | | | | | | | | | | | | | | | | | | | | |
| Medicine Bow Mine |  10,400 Btu/lb, 0.6 percent sulfur (©Union Pacific, 2010c); high volatile C bituminous | Arch Coal | | Medicine Bow Formation (Upper Cretaceous) and Ferris Formation (Upper Cretaceous and Paleocene) |  |  |  | Carbon County, Wyoming, six miles west of Hanna, Wyoming, on U.S. Highway 30. | <table><tr><th>Year</th><th>Coal Tonnage (thousand short tons)</th></tr><tr><td>2004</td><td>148</td></tr><tr><td>2003</td><td>139</td></tr><tr><td>2001</td><td>455</td></tr><tr><td>2000</td><td>406</td></tr></table> (closed in 2005; U.S. Department of Labor, 2011, and Wyoming Department of Environmental Quality, 2011). | Year | Coal Tonnage (thousand short tons) | 2004 | 148 | 2003 | 139 | 2001 | 455 | 2000 | 406 | Fully reclaimed. | Inactive surface mine, reclaimed. | Surface. | Normal faults showing displacement of Ferris coal beds in the highwall of the Medicine Bow Coal Mines (from Flores and others, 1999a). |  | |
| Year | Coal Tonnage (thousand short tons) | | | | | | | | | | | | | | | | | | | | | | | | |
| 2004 | 148 | | | | | | | | | | | | | | | | | | | | | | | | |
| 2003 | 139 | | | | | | | | | | | | | | | | | | | | | | | | |
| 2001 | 455 | | | | | | | | | | | | | | | | | | | | | | | | |
| 2000 | 406 | | | | | | | | | | | | | | | | | | | | | | | | |
| Rosebud Mining and Reclamation |  Subbituminous A | Kiewit Mining Group | | Hanna Formation |  |  |  | Hanna, Wyoming; eastern flank of Hanna syncline. | <table><tr><th>Year</th><th>Coal Tonnage (thousand short tons)</th></tr><tr><td>1992</td><td>2</td></tr><tr><td>1991</td><td>11</td></tr><tr><td>1990</td><td>176</td></tr><tr><td>1989</td><td>72</td></tr></table> (closed in 1989; U.S. Department of Labor, 2011, and Wyoming Department of Environmental Quality, 2011). During its 40-year history, Rosebud mine has yielded 32 million short tons of coal. (©Kiewit, 2010). | Year | Coal Tonnage (thousand short tons) | 1992 | 2 | 1991 | 11 | 1990 | 176 | 1989 | 72 | Fully reclaimed. What began as a voluntary reclamation program in 1965, evolved into the complete reclamation of 4,000 acres. The land is now restored to a quality equivalent to or greater than its pre-mined condition. Rosebud was the first Wyoming mine to receive a complete bond release. As the reclamation efforts evolved, many innovative techniques, such as slot drilling, were developed (©Kiewit, 2010). | Reclaimed; production from 1961 to 1992. 11 pits made up the Rosebud Coal Sales Company (©Kiewit, 2010). | Surface mine operation (©Kiewit, 2010). | The reclaimed land of the former Rosebud Coal Mine (©Kiewit, 2010). | Former Rosebud Coal Mine operations (©Kiewit, 2010). |  |
| Year | Coal Tonnage (thousand short tons) | | | | | | | | | | | | | | | | | | | | | | | | |
| 1992 | 2 | | | | | | | | | | | | | | | | | | | | | | | | |
| 1991 | 11 | | | | | | | | | | | | | | | | | | | | | | | | |
| 1990 | 176 | | | | | | | | | | | | | | | | | | | | | | | | |
| 1989 | 72 | | | | | | | | | | | | | | | | | | | | | | | | |
| Seminole II Mine |  11,000 Btu/lb, 0.65 percent sulfur (©Union Pacific, 2010d); subbituminous A and B. | Arch Coal | | Hanna Formation |  |  |  | Carbon County, Wyoming | <table><tr><th>Year</th><th>Coal Tonnage (thousand short tons)</th></tr><tr><td>2004</td><td>57</td></tr><tr><td>2003</td><td>136</td></tr><tr><td>2002</td><td>258</td></tr><tr><td>2001</td><td>298</td></tr></table> (closed in 2005; U.S. Department of Labor, 2011, and Wyoming Department of Environmental Quality, 2011). Recoverable reserves are estimated to be approximately 8.5 million short tons (©Union Pacific, 2010c). | Year | Coal Tonnage (thousand short tons) | 2004 | 57 | 2003 | 136 | 2002 | 258 | 2001 | 298 | Fully reclaimed. After mining activities ceased in an area, Arch Coal planted native grasses, and shrubs that created new habitat for big game and small animals (©Arch Coal, Inc., 2007). | Reclaimed; began operation in 1973 (©Union Pacific, 2010d). | Surface (©Union Pacific, 2010d). | Coal and carbonaceous shale in an abandoned mine north of the town of Hanna (from Flores and others, 1999b). |  | |
| Year | Coal Tonnage (thousand short tons) | | | | | | | | | | | | | | | | | | | | | | | | |
| 2004 | 57 | | | | | | | | | | | | | | | | | | | | | | | | |
| 2003 | 136 | | | | | | | | | | | | | | | | | | | | | | | | |
| 2002 | 258 | | | | | | | | | | | | | | | | | | | | | | | | |
| 2001 | 298 | | | | | | | | | | | | | | | | | | | | | | | | |
| Shoshone Mine |  10,840 Btu/lb, 0.63 percent sulfur (©Union Pacific, 2010e); subbituminous A. | RAG American Coal (©Union Pacific, 2010e) | Rail facilities were tied to the Shoshone Mine (Hutchinson, 2001), but have been removed since the mine is inactive. | From the Hanna No. 80 seam, which averages 17 feet in thickness, the Shoshone Mine had produced consistent, high-quality, low-sulfur coal. (©Union Pacific, 2010e). |  |  |  | 4 miles north of Hanna, Wyoming, in Carbon County | <table><tr><th>Year</th><th>Coal Tonnage (million short tons)</th></tr><tr><td>2000</td><td>1.2</td></tr><tr><td>1999</td><td>1.7</td></tr><tr><td>1998</td><td>1.9</td></tr><tr><td>1997</td><td>2.8</td></tr></table> (closed 2001; U.S. Department of Labor, 2011, and Wyoming Department of Environmental Quality, 2011). Recoverable reserves are estimated to be approximately 8.5 million short tons (©Union Pacific, 2010c). | Year | Coal Tonnage (million short tons) | 2000 | 1.2 | 1999 | 1.7 | 1998 | 1.9 | 1997 | 2.8 | Fully reclaimed. A contested case hearing concluded that the reclamation bond covered the obligation to reclaim the rail facilities (Hutchinson, 2001). | The Shoshone Mine is no longer active, and is fully reclaimed. | Underground longwall (©Union Pacific, 2010e). |  | | |
| Year | Coal Tonnage (million short tons) | | | | | | | | | | | | | | | | | | | | | | | | |
| 2000 | 1.2 | | | | | | | | | | | | | | | | | | | | | | | | |
| 1999 | 1.7 | | | | | | | | | | | | | | | | | | | | | | | | |
| 1998 | 1.9 | | | | | | | | | | | | | | | | | | | | | | | | |
| 1997 | 2.8 | | | | | | | | | | | | | | | | | | | | | | | | |
| Stansbury Mine (Proposed); Aka, Little Patriot |  14 percent moisture, 5.2 percent ash, 95 percent sulfur, 10,926 BTU/pound (©Al Perry Enterprises, 2006); subbituminous A to high volatile C bituminous. | New Stansbury Coal Company | The mine is located on the main line of Union Pacific Railroad for eastern and western deliveries (©Al Perry Enterprises, 2006). This mine is currently closed. Several years ago, a group proposed reopening this mine and renaming it, The Little Patriot Mine. | Cretaceous, Mesaverde Group, Rock Springs Formation, No. 8 coal seam |  |  |  | 7 miles north of Rock Springs, Wyoming. | <table><tr><th>Year</th><th>Coal Tonnage (thousand short tons)</th></tr><tr><td>1993</td><td>205</td></tr><tr><td>1992</td><td>453</td></tr><tr><td>1991</td><td>261</td></tr><tr><td>1990</td><td>189</td></tr></table> (closed in 1994; U.S. Department of Labor, 2011, and Wyoming Department of Environmental Quality, 2011). Production was planned for up to 3.0 million short tons per year, using innovative and highly mechanized mining equipment (©Al Perry Enterprises, 2006). | Year | Coal Tonnage (thousand short tons) | 1993 | 205 | 1992 | 453 | 1991 | 261 | 1990 | 189 | Underground mine. | Reclaimed. About 4 years ago, there was discussion of reopening and renaming this mine The Little Patriot in memory of 9/11/2001. | Underground. Mine plans call for use of continuous miners in room and pillar retreat mining from No. 8 coal seam for the first 5 years. Life of mine is projected at 20 years (©Al Perry Enterprises, 2005). |  | | |
| Year | Coal Tonnage (thousand short tons) | | | | | | | | | | | | | | | | | | | | | | | | |
| 1993 | 205 | | | | | | | | | | | | | | | | | | | | | | | | |
| 1992 | 453 | | | | | | | | | | | | | | | | | | | | | | | | |
| 1991 | 261 | | | | | | | | | | | | | | | | | | | | | | | | |
| 1990 | 189 | | | | | | | | | | | | | | | | | | | | | | | | |

Coal Mines in Southwestern Wyoming

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2012

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