III. EXISTING & POTENTIAL AIR POLLUTION SOURCES

The Class I air quality areas on the WRNF are those wilderness areas that were designated under the Wilderness Act of 1964 prior to or in 1977. One potential threat to air quality in these areas are from airborne pollutants that are transported by gradient and/or local winds from outside sources.

The prevailing winds over the WRNF are from the southwest, west, or west-northwest. Following the passage of cold fronts, the gradient winds shift to a northwest to northerly direction. This condition normally persists for a few days and then changes back to a more westerly flow. Occasionally, gradient wind direction shifts to a more southerly flow. This is particularly common during July and August when summer "monsoon" conditions become established. Most of the precipitation during the summer months is the result of this southerly flow of sub-tropical moisture.

Locally, diurnal winds flow up and down major river drainages in the Forest. The Colorado, Roaring Fork, Eagle, Frying Pan, White, and Blue River drainages all experience up-canyon winds during the day and a down-slope flow at night. Due to the east-west orientation of most of these drainages, the up-canyon winds are usually accentuated by the prevailing westerly winds aloft. Down canyon winds at night are relatively light, and night-time inversions in the valleys are common.

A. EXISTING REGIONAL SOURCES

Air pollution emission sources are generally categorized as point, area, or mobile sources. A point source emits pollution through an identifiable stack. Area sources are emissions from a number of sources too small, numerous, or difficult to be inventoried individually. Area sources generally extend over a large area and can include vehicle emissions, natural gas well pads, and certain commercial operations such as dry cleaners. Fire and wind blown dust are often considered area emission sources. Mobile sources typically describe emissions from road vehicles.

1. REGIONAL EMISSIONS INVENTORY

Tables 12 through 16 identify major point sources with emission values that are at or greater than 100 tons/year of a criteria pollutant. A summary of emissions from minor point sources and area sources is provided in Table 17. The annual emissions for the Colorado and Utah plants are based on 2002 emission data obtained from the Western Regional Air Partnership (WRAP) Emissions Data Management System (http://www.wrapedms.org/default_login.asp).

Table 12 - Major Point Source Emissions (greater than 100 tons/year of NOx)

Source	Location	Annual Emissions (tons/year)
Hunter Power Plant	Emery County, UT	19,869
Tri State Generation – Craig	Moffat County, CO	19,381
Huntington Power Plant	Emery County, UT	11,198
Public Service CO – Hayden Plant	Routt County, CO	8,603
Carbon Power Plant	Carbon County, UT	3,380
Public Service Co. – Cameo Plant	Mesa County, CO	1,477
Encana Oil & Gas (USA), Inc. – Dragon Trl	Rio Blanco Cnty, CO	746
Northwest Pipeline Corp. Rangely Sta.	Rio Blanco Cnty, CO	714
Williams Prod. RMT Corp. - Parachute	Garfield County, CO	511
Questar Gas Management Co.	Moffat County, CO	293
Canyon Gas Res. – Rifle C.S.	Garfield County, CO	249
San Arroyo Plant	Grand County, UT	214
Tri State Gen. & Trans. – Rifle Sta.	Garfield County, CO	202
West Texas – Piceance Crk GP	Rio Blanco Cnty, CO	192
Exxon Mobil Corp. – Piceance Crk	Rio Blanco Cnty, CO	182
Questar Gas Mgt – E. Hiawatha C.S.	Moffat County, CO	173
Canyon Gas Res. – Foundation Ck	Rio Blanco, CO	165
American Gypsum Company	Eagle County, CO	160
Canyon Resources - Greasewood	Rio Blanco Cnty, CO	159
Public Service Co. White Rvr Dome Sta	Rio Blanco Cnty, CO	137
Canyon Gas Res. – N. Douglas Ck	Rio Blanco Cnty, CO	120
Public Service Co – Baxter Station	Garfield County, CO	111
CO Interstate Gas Co. - Greasewood	Rio Blanco Cnty, CO	108
Encana Oil & Gas (USA), Inc. – W. Douglas Crk	Rio Blanco Cnty, CO	105

Table 13 - Major Point Source Emissions (greater than 100 tons/year of SO2)

Source	Location	Annual Emissions (tons/year)
Huntington Power Plant	Emery County, UT	13,714
Tri State Generation – Craig	Moffat County, CO	10,391
Hunter Power Plant	Emery County, UT	7,029
Carbon Power Plant	Carbon County, UT	6,765
Public Service Co. – Cameo Plant	Mesa County, CO	3,059
Public Service CO – Hayden Plant	Routt County, CO	2,868
Sunnyside Cogeneration Facility	Carbon County, UT	1,013

Table 14 - Major Point Source Emissions (greater than 100 tons/year of PM10)

Source	Location	Annual Emissions (tons/year)
Huntington Power Plant	Emery County, UT	1,067
Hunter Power Plant	Emery County, UT	1,226
ColoWoyo Coal Co.	Moffat County, CO	924
Tri State Generation – Craig	Moffat County, CO	445
Trappers Mining Inc.	Moffat County, CO	429
Carbon Power Plant	Carbon County, UT	221
Public Service Co. – Cameo Plant	Mesa County, CO	133
Public Service CO – Hayden Plant	Routt County, CO	310
Bowie Res., LLC – Bowie No. 2 Mine	Delta County, CO	253
Seneca Coal Co. Seneca II W	Routt County, CO	180
Seneca Coal Co.	Routt County, CO	167
Twentymile Coal Co. – Foidel Crk	Routt County, CO	139
Moffat County Road Dept.	Moffat County, CO	123

Table 15 - Major Point Source Emissions (greater than 100 tons/year of CO)

Source	Location	Annual Emissions (tons/year)
Tri State Generation – Craig	Moffatt County, CO	1,246
Hunter Power Plant	Emery County, UT	1,083
Huntington Power Plant	Emery County, UT	689
Williams Prod. RMT Corp. - Parachute	Garfield County, CO	514
Public Service Co. – Hayden Plant	Routt County, CO	453
Encana Oil & Gas (USA), Inc. – Dragon Trl	Rio Blanco Cnty, CO	296
Canyon Gas Resources – Rifle C.S.	Garfield County, CO	210
Questar Gas Management Co.	Moffat County, CO	189
American Soda LLP – Piceance Fac.	Rio Blanco Cnty, CO	182
Public Service Co. – Baxter Station	Garfield County, CO	167
Carbon Power Plant	Carbon County, UT	153
Public Service Co. White Rvr Dome Sta	Rio Blanco Cnty, CO	148
Questar Gas Mgt – E. Hiawatha C.S.	Moffat County, CO	141
West Texas – Piceance Crk GP	Rio Blanco Cnty, CO	119
Exxon Mobil Corp. – Piceance Crk	Rio Blanco Cnty, CO	118
Williams Prod. RMT Co. - Grand Valley	Garfield County, CO	116
Canyon Resources - Greasewood	Rio Blanco Cnty, CO	114
Westwater Compressor Station	Grand County, CO	102
Canyon Gas Res. – N. Douglas Ck	Rio Blanco Cnty, CO	100
Northwest Pipeline Corp. Rangely Sta.	Rio Blanco Cnty, CO	100

Table 16 - Major Point Source Emissions (greater than 100 tons/year of VOC)

Source	Location	Ann. Emissions (tons/year)
Sunnyside Cogeneration Facility	Carbon County, UT	493
Encana Oil & Gas – Hunter Mesa	Garfield County, CO	193
Canyon Gas Resources – Rifle C.S.	Garfield County, CO	250
Encana Oil & Gas (USA), Inc. – Dragon Trl	Rio Blanco Cnty, CO	233
American Soda LLP – Piceance Fac.	Rio Blanco Cnty, CO	219
Canyon Gas Res. – N. Douglas Ck	Rio Blanco Cnty, CO	200
Encana Oil & Gas (USA), Inc. – W. Douglas Crk	Rio Blanco Cnty, CO	202
Carbon Power Plant	Carbon County, UT	153
Williams Prod. RMT Corp. - Parachute	Garfield County, CO	140
Exxon Mobil Corp. – Piceance Crk	Rio Blanco Cnty, CO	138
Barrett Res. Corp/Williams GVPL	Garfield County, CO	131
Chevron USA Prod. Co. – Rangely Fld	Rio Blanco Cnty, CO	130
Hunter Power Plant	Emery County, UT	130
Public Service Co. – Baxter Station	Garfield County, CO	107
Encana Oil & Gas (USA), Inc. – W.Dragon Trl	Rio Blanco Cnty, CO	106
Chevron USA – Wilson Crk Gas PLT	Rio Blanco Cnty, CO	104
Questar Gas Management Company	Moffat County, CO	100

There are also a number of smaller point and area sources located within and adjacent to the Forest. The annual emissions from these smaller sources are summarized by county in Table 17. These values are also based on 2002 emissions data from WRAP. They do not include mobile source emissions.

Table 17 – Area and Minor Point Source Emissions - Colorado

County	Annual Emissions - Tons per Year				
	PM10	**SO2**	**NO_X**	**CO**	**VOC**
Delta					
Point Source	217	0	6	1	95
Area Source	788	47	80	2,467	847
Total	**1,005**	**47**	**86**	**2,468**	**942**
Eagle					
Point Source	163	1	177	83	165
Area Source	1,774	64	126	2,563	1,432
Total	**1,937**	**65**	**303**	**2,646**	**1,597**
Garfield					
Point Source	266	10	1,484	1,336	3,665
Area Source	1,491	88	2,350	3,729	5,799
Total	**1,757**	**98**	**3,834**	**5,065**	**9,464**
Gunnison					
Point Source	162	0	10	3	73
Area Source	567	9	45	1,073	432
Total	**729**	**9**	**55**	**1,076**	**505**
Mesa					
Point Source	467	12	640	534	1,174
Area Source	3,751	148	497	2,885	3,239
Total	**4,218**	**160**	**1,137**	**3,419**	**4,403**
Moffat					
Point Source	87	5	499	216	1,203
Area Source	564	19	453	1,160	673
Total	**651**	**24**	**952**	**1,376**	**1,876**
Pitkin					
Point Source	43	0	0	0	38
Area Source	203	34	53	216	342
Total	**246**	**34**	**53**	**216**	**380**
Rio Blanco					
Point Source	320	6	963	1,130	1,177
Area Source	132	14	1,336	729	1,504
Total	**452**	**20**	**2,299**	**1,859**	**2,681**
Routt					
Point Source	248	1	14	2	87
Area Source	1,226	37	72	768	478
Total	**1,474**	**38**	**86**	**770**	**565**

2. LOCAL EMISSIONS INVENTORY

An emissions inventory was conducted in 2008 for Garfield County to identify pollution sources within the county (Pierce 2008). The following charts are a result of this inventory of 2005 pollution sources.

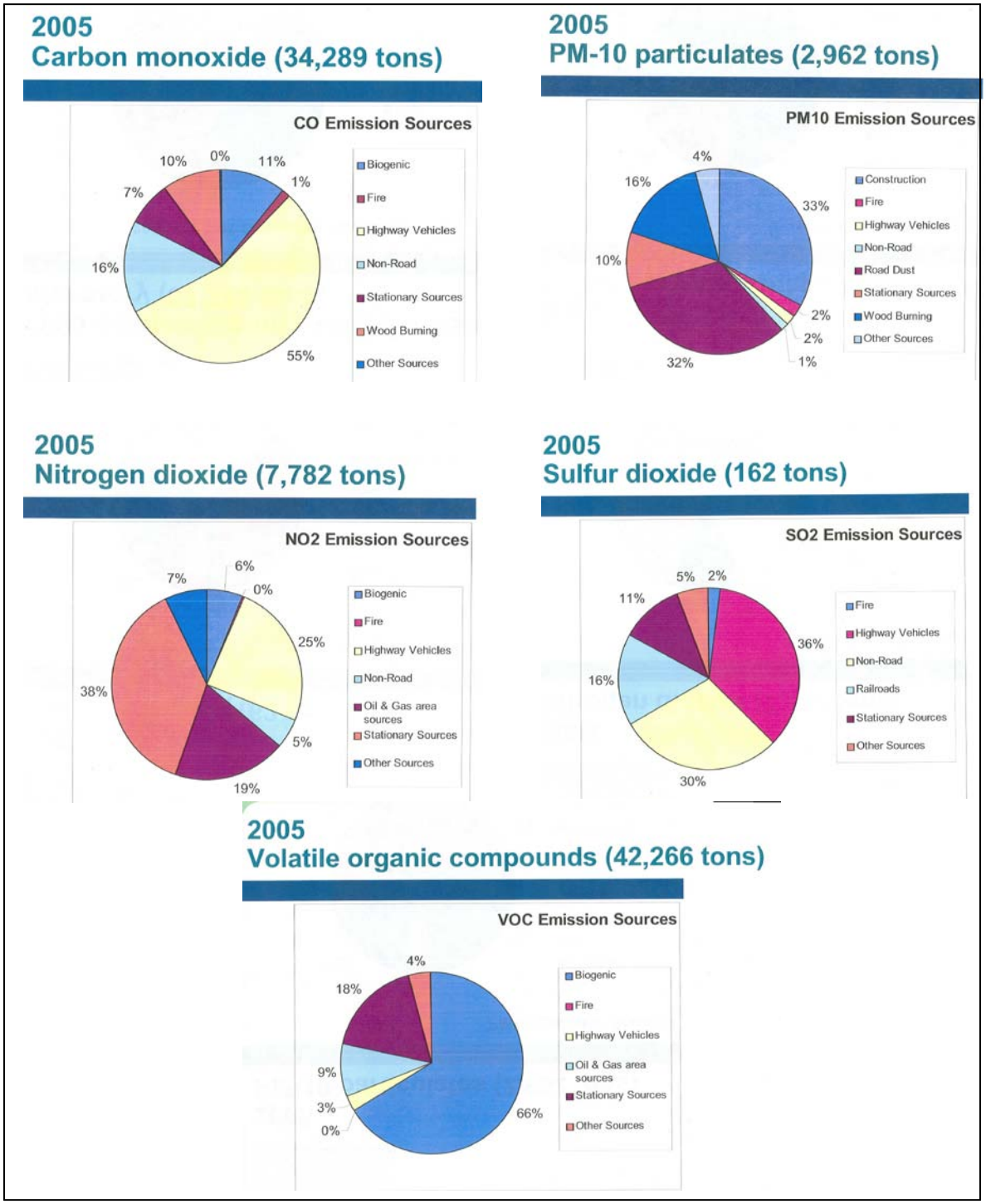

Figure 1. Garfield County Emissions Inventory for 2005 (Pierce 2008).

Ozone is a secondary pollutant formed by the combination of nitrogen oxides, volatile organic compounds, sunlight and heat. Of the stationary emission sources identified for nitrogen dioxide and volatile organic compounds, over 90 percent are related to oil and gas development. These sources include emissions from compressors, condensate tanks, and dehydrators.

3. OTHER EMISSION SOURCES

During the summer monsoon season southerly air flow conditions are prevalent and can carry pollutants to the WRNF from industrial and urban sources located as far away as southern California, Mexico, and the four corners area of New Mexico and Arizona. The Arizona/New Mexico sources include the Four Corners Power Plant (New Mexico), the San Juan Generating Station (New Mexico), the Navajo Steam Generating Plant (Arizona), and the Magma Copper Smelter (San Miguel, Arizona).

Atmospheric deposition from these sources may occur in all three of the WRNF's Class I air quality areas and all five of its Class II wilderness areas. However, because of the southerly air flow that is necessary for transport of the pollutants, the Flat Tops and Maroon Bells-Snowmass Wilderness areas (Class I) and the Collegiate Peaks and Hunter-Fryingpan Wilderness areas (Class II) likely have the greatest potential to capture this deposition.

Major wildfire events in the western United States temporarily impact visibility in wilderness areas on the WRNF. Because wildland fires are considered a natural phenomenon, their smoke is not necessarily considered an adverse impact on wilderness values.

4. EMISSIONS MODELING

Air resource impacts of local and regional emission sources were modeled as part of an environmental assessment of Hell's Gulch Phase II natural gas development project (USDA 2008). The cumulative effects analysis for this project indicates visibility impacts to all three Class I wilderness areas on the WRNF. The modeling suggests that these impacts are principally caused by emissions from the largest pollution sources upwind of the Forest (i.e. coal fired power plants).

B. POTENTIAL FUTURE IMPACTS

Deposits of coal, natural gas, and oil shale are located to the southwest, west, and northwest of the WRNF's wilderness Areas. Future development of these resources poses a potential threat to air quality related values throughout the Forest.

1. OIL SHALE DEVELOPMENT

Some of the richest oil shales in the world are located in the Tertiary Green River Formation deposits in the Piceance Creek basin of western Colorado and the Uinta Basin of eastern Utah (Soholt and Wiedenbaum 1981). Tar sand deposits have also been identified as important energy development sources. Most of these deposits in the United States occur in eastern Utah roughly between Vernal to the north and Monticello to the south. Estimates indicate that these deposits hold the equivalent of 800 billion barrels of oil which is enough to meet current U.S. levels of demand for 110 years (Caswell 2008). Given the high costs of fuel, public pressure for oil shale development is rising.

During the energy crisis of the 1970's and early 80's, intensive development of oil shale deposits was initiated. At the peak of the activity in 1981, fourteen projects were proposed in western Colorado and eastern Utah. It was estimated that by 1985 the total average emission rate from the projects on-line would be: SOx - 6,454 tons/year, NOx - 24,078 tons/year, and TSP - 6,850 tons/year (Fox, Haddow, and Murphy 1981). Total emission rates were expected to increase steadily through 2003. Deposition of some of these pollutants in the Flat Tops Wilderness was anticipated by most researchers. These forecasts became somewhat academic when the economics behind oil shale development collapsed in 1982.

Oil shale and tar sand deposits remain a potentially rich source of energy. With the United State's current desire for domestic energy sources there is a renewed level of interest in the development of these resources. Several research, development and demonstration (RD&D) projects by industry are underway in the Piceance and Uinta Basins to test the viability of producing shale oil in commercial quantities.

Most of these RD&D projects are testing in situ processing technology that extracts the oil by heating the shale underground. The energy requirement to heat the shale and extract oil is an air quality concern if that energy source comes from a major pollutant source. In western Colorado the major energy source for electricity is coal fire power plants. Emissions from these plants could increase significantly in response to commercial oil shale development.

In December, 2007, the BLM released a draft programmatic environmental impact statement (PEIS) addressing the potential to lease up to 1.9 million acres of BLM-administered land in Colorado, Utah and Wyoming for oil shale and tar sand development. Figure 2 shows the location of oil shale resources in the Green River Formation in Colorado, Utah, and Wyoming. The final PEIS does not quantify air pollution emissions that could result from developing these resources.

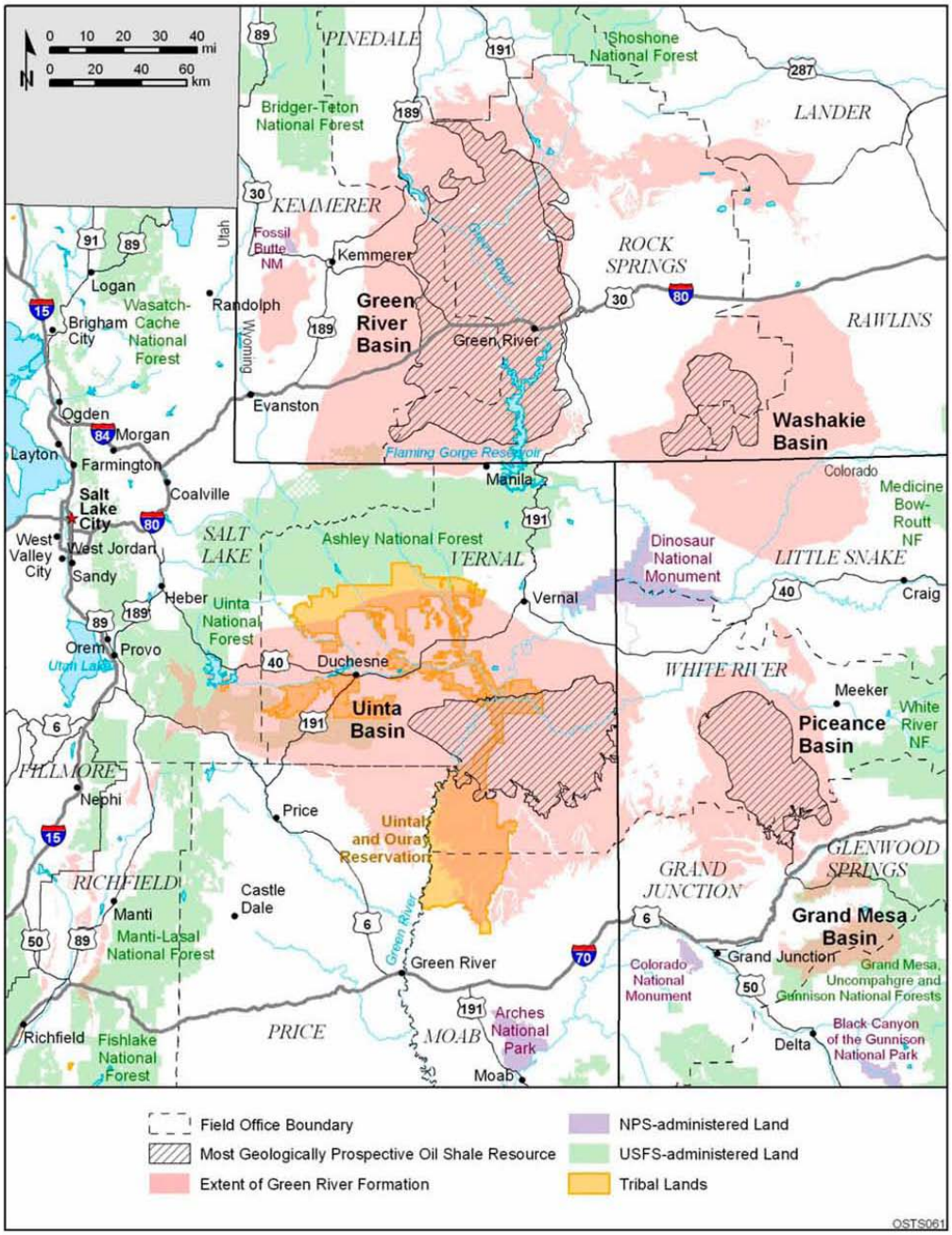

Figure 2. Most geologically prospective oil shale resources within the Green River formation basins in Colorado, Utah, and Wyoming (from BLM 2008).

2. COAL DEVELOPMENT

Significant deposits of coal are located along the western portion of the Forest and to the northwest in the Craig area. Coal reserves in Colorado are estimated to be 16.4 billion tons and expected to be exhausted by the early 2200's (CDNR 2005). Figure 3 displays coals resources in Colorado.

Coal is seen as an important strategic energy reserve in the United States. In Colorado, over 80% of the State's electricity is supplied by coal power. No known new coal-fired power plants are planned for the region around the WRNF. However, proposals made in the 1980's for coal-fired facilities underscore the potential of future development given the nation's push towards energy dependence from foreign suppliers.

One of these proposals was by Mid-Continent Resources for a co-generation facility near Carbondale. The facility would have annually produced 80 megawatts of electricity utilizing waste coal from Mid-Continent's mines at Redstone. Following a methane explosion that killed 15 people and their subsequent bankruptcy, Mid-Continent discontinued mining operations at Redstone. Another proposal was from Eastside Energy Corporation, who had proposed an 80 megawatt power generation facility near Silt. This company encountered financial and local permitting problems and never got off the ground.

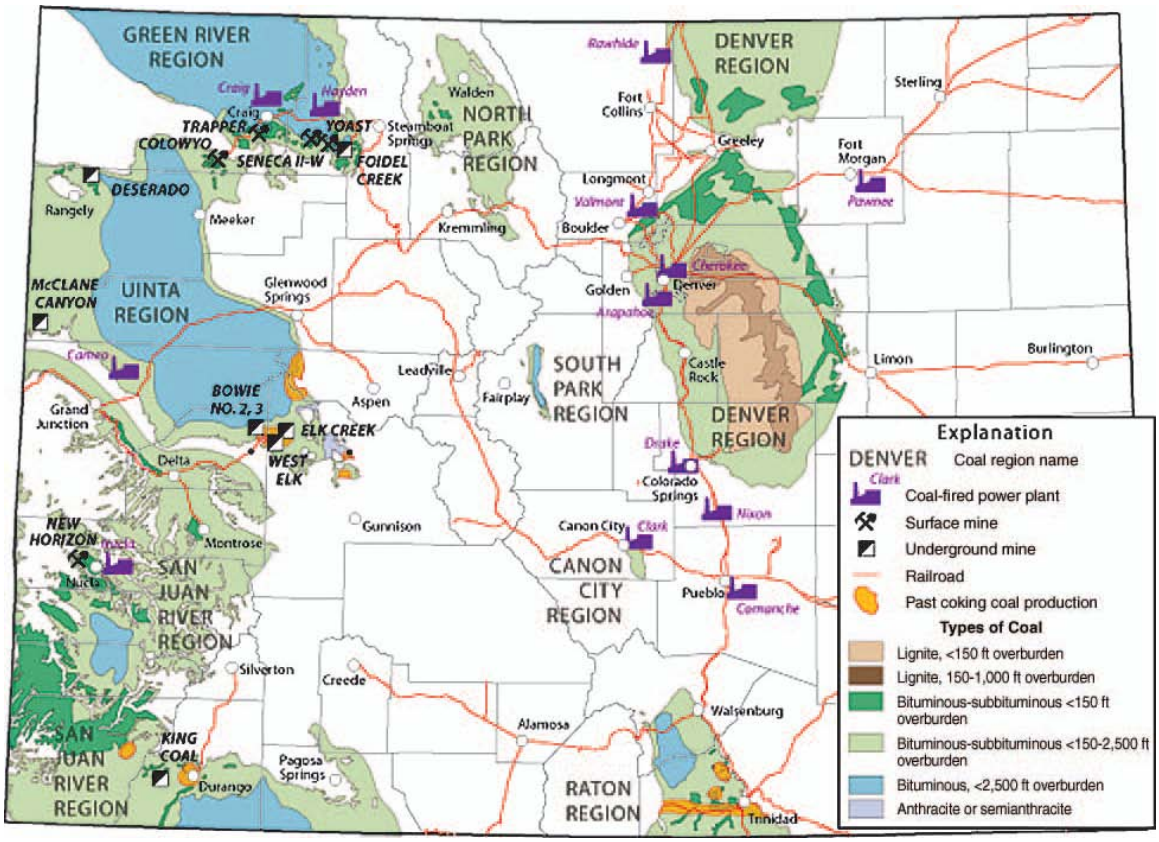

Figure 3. Coal regions of Colorado showing active coal mines and coal-fired power plants. The types of coal mined are also shown for each region. (from CDNR 2005)

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