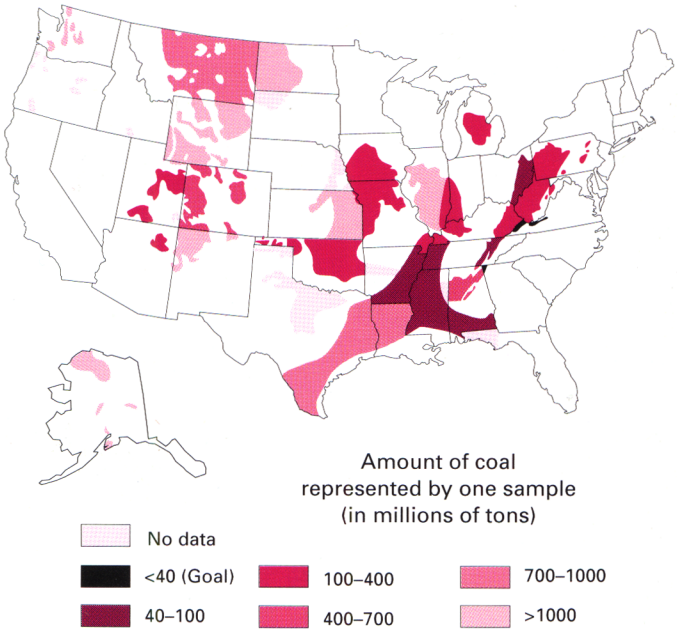

Concentration of analyzed samples in the major U.S. coal basins. The USGS's coal-quality data base contains approximately 10,000 coal-sample analyses.

USGS scientists have achieved important advances over the past 30 years in understanding coal chemistry.

Determining the mode of occurrence of metals and other chemicals in coal is key to the ability to predict how different coals will respond to the latest technology and uses. For example, selenium in trace amounts (about 1 part per million, or ppm) occurs in at least six different forms in coals of the Powder River basin in Wyoming. Coal scientists, including USGS workers, have determined that the form of selenium most likely to create water pollution is found in concentrations of about 0.1 ppm. Certain coals in the Gulf Coast region contain about 5 ppm selenium, but environmental problems attributed to this trace element are minimal because the amount of rainfall received in this area is sufficient to flush selenium from soil and to dilute it in water bodies. By contrast, insufficient rainfall in Wyoming and Montana, where coals contain less than 1 ppm selenium, allows animals and plants to take up and retain selenium in harmful quantities. Therefore, the popular belief that the greater the quantity of an undesirable element, the worse the environment will suffer, can be incorrect.

USGS geologists studying bituminous coal along a road cut in West Virginia.

Coal mining in thick, high-quality sub-bituminous coal in Wyoming.

USGS research suggests that Utah coals may be economically viable despite their high sodium content.

Engineers are generally concerned about the amount of sodium in coal because sodium contributes to the fouling of heat exchanger pipes: a multimillion-dollar problem. The ash from Wasatch coals of Utah contain as much as 15 percent sodium, or 5 times normal levels; consequently, energy companies have avoided these coals. USGS research indicates that the sodium is bound in a zeolite mineral in coal cleat that can easily be removed prior to combustion. The remaining sodium is organically bound and falls within normal engineering limits. Prior to these studies, energy companies did not know how sodium and other chemicals occurred in coals. Today, the USGS is the primary group conducting such studies on all elements. The USGS also maintains the National Coal Resources Data System which contains the largest publicly-available coal-quality data base in the world. Although this data base was originally designed to assist energy companies with their exploration efforts, today its use extends to providing data and information to EPA and to the utilities on the amounts of trace elements being mobilized by combustion in U.S. power plants.

EPA, utilities, and coal mining industries are using USGS's coal-quality data base to estimate the amount of air pollution derived from coal combustion. The data base will also be used for projecting how fuel switching or coal cleaning may reduce pollution.

USGS studies indicate that much of the waste product returned to the ground contains valuable industrial and metal resources.

This country produces more waste products from coal extraction and use than from any other non-energy product except sand and gravel. Only 20 percent of coal waste products are used, primarily in the construction industry, while about 80 million tons are put back in the ground. Much of this waste contains potentially hazardous chemicals, such as trace metals, but it also contains significant quantities of valuable metals. If coal waste products were "recycled" for the metals they contained (such as copper, nickel, cadmium, mercury, and silver), the amount of hazardous trace metals being dispersed would be reduced and the United States would be less dependent on foreign sources of these metals. The concept of using the entire resource instead of only a portion of it is both economically and environmentally sound.

For more information please contact: Dr. Robert B. Finkelman, USGS, MS 956, Reston, VA 22092 (703) 648-6412