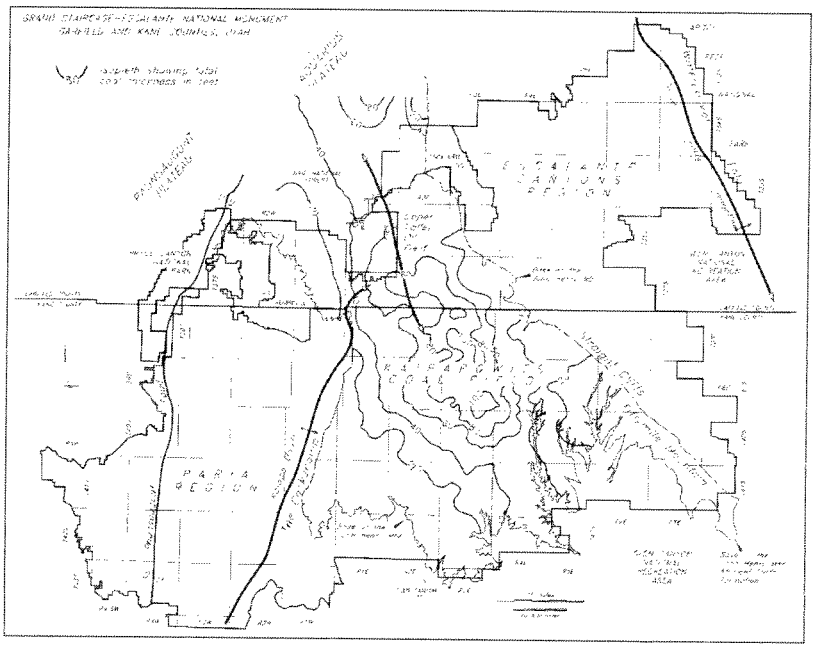
UGS
SURVEY NOTES, V. 29, n. 3, p. 1-3, May 1997

Energy and Mineral Resources within the Grand Staircase - Escalante National Monument

by UGS Staff

Recently, the Utah Geological Survey (UGS) released a report summarizing the present knowledge of mineral and energy resources of the newly created Grand Staircase-Escalante National Monument. This article is excerpted from that report, which was released as UGS Circular 93. Since the designation of the Grand Staircase-Escalante National Monument by President Clinton on September 18, 1996, unresolved issues regarding the mineral value of state and federal lands within the monument have come to the forefront of debates. The monument encompasses 1.7 million acres in Kane and Garfield Counties, Utah (figure 1) and includes some of the most energy-rich lands in the lower 48 states. The U.S. Bureau of Land Management (BLM), the agency assigned to manage the monument, recently has begun a three-year program to formulate a management plan. Part of the management plan will likely focus on the disposition of more than 176,000 acres of Utah School Trust lands that are now monument in-holdings. The School and Institutional Trust Lands Administration (SITLA) controls mineral rights on more than 200,000 acres of the monument.



Grand Staircase-Escalante National Monument showing Kaiparowits coal field. Upper Valley oil field, physiographic features, and major geologic structures.

During President Clinton's proclamation speech, he addressed the issue of lands within the monument belonging to the school children of Utah. He stated in effect that Utah's school children would not be denied the value held within these lands. Moreover, he directed the Interior Secretary to quickly move to trade the Utah School Trust lands within the monument for other federal lands or resources in Utah that are of comparable value. With the creation of the monument, mineral lands may have been effectively removed from consideration for mining, oil and gas exploration, and other resource production (table 1).

The main mineral-resource issue is the inclusion of the Kaiparowits Plateau coal field within the monument boundary. The coal field is the largest in Utah, containing over 62 billion tons of coal in place (Hettinger and others, 1996). Using a resource assessment recently completed by the U.S. Geological Survey (USGS) (Hettinger and others, 1996) and excluding resources considered unminable, the UGS estimates that, at a minimum, 11.36 billion tons of the coal resource are technologically recoverable from the entire field. Of this total, the UGS further estimated that some 870 million tons of this coal are technologically recoverable from Utah School Trust lands within the monument.

The Utah Office of Energy and Resource Planning (OERP) performed a

preliminary valuation of coal lands in the monument and projected royalty and bonus bid revenues to the State of Utah and the Federal Government. From this analysis, OERP determined that potential revenue to the state from recoverable coal could be $9.25 billion in present dollars over the life of mining. The U.S. Government would receive an equal amount. Revenue to the Utah School Trust could be an additional $1.54 billion. OERP also estimated that $65.15 million in present dollars could have been realized as income by the state just from the proposed Smoky Hollow mine project of Andalex Resources over the proposed 30-year mine life. Of this total, OERP estimated that the Smoky Hollow project would have generated some $17.97 million in income to the State School Trust.

Most of the Kaiparowits Plateau coal field also has potential for development of coal-bed methane gas, even though no definitive studies have been done to date. Based on research in other Utah coal fields and extrapolating to the Kaiparowits field, the UGS estimates that the coal beds of the Straight Cliffs Formation contain between 2.6 and 10.5 trillion cubic feet of methane.

The monument contains all the elements necessary for major oil and gas accumulations: source rocks, reservoirs, and trapping mechanisms. Commercial deposits of oil have been discovered both within and along the margins of the monument at Upper Valley field. Although the characteristics of the monument and Kaiparowits basin as a whole are favorable for the accumulation of oil and gas, wildcat-exploration-well density is extremely sparse. Only 47 exploratory wells have been drilled within the monument, or an average of 57 square miles per well. The postulated reasons for this apparent lack of exploratory activity are: (1) inaccessibility, (2) lack of oil and gas pipelines, (3) low success rates, (4) the collapse of world oil prices in 1986 and a nationwide oversupply of natural gas, and (5) environmental concerns and restrictions. Although the exploration risk is high, the monument could contain major accumulations of oil based on the production history of Upper Valley field and geologic evidence.

Solid hydrocarbons impregnate Triassic-age sandstone and siltstone along the flanks of the breached, Circle Cliffs anticline in the northeastern part of the monument. Known as tar sand, such deposits are essentially exhumed, fossil oil reservoirs where the lighter, more volatile fractions have been removed due to exposure. The entire west flank of the Circle Cliffs tar-sand deposit and a small part of the east flank are located in the monument. The remainder is within Capitol Reef National Park. Although there has been little recent commercial interest in extracting oil from the tar-sand deposits of the Circle Cliffs, researchers have estimated that as many as 550 million barrels of oil might be contained within tar sands of the monument.

Metallic mineral occurrences in the monument include gold, copper, manganese, titanium, zirconium, uranium, and vanadium. Most occurrences are small, low-grade, and have little development potential. Minerals such as titanium, zirconium, and vanadium, however, are considered "strategic and critical" and may have development potential within the monument. Uranium with associated copper plus trace amounts of cobalt occurs in the Shinarump Member of the Triassic Chinle Formation in the Circle Cliffs area of the northeastern section of the monument. About 75,000 pounds of U_3O_8 was reportedly produced from these deposits during the 1950s and 1960s. Vanadium associated with the uranium was produced as a by-product. Anomalously radioactive outcrops of the Jurassic Morrison Formation have been noted on the east side of Fiftymile Mountain, suggesting the possibility that uranium minerals extend beneath the Kaiparowits Plateau.

Fossil, placer titanium-zirconium deposits occur in the Cretaceous Straight Cliffs Formation in a 40- to 50-mile-long belt along the east side of the Kaiparowits Plateau. The deposits were never developed commercially because they are remote and because of problems associated with mining and beneficiation. However, the deposits are reportedly rich in rutile (titanium) and zircon (zirconium).

Records obtained from the Utah Division of Oil, Gas and Mining indicate that five small mining operations are currently under permit in the monument. About 300 tons of alabaster, a fine-grained form of gypsum used for ornamental carvings, is quarried annually in four of these operations. The fifth is a suspended operation that mined petrified wood.

Additional information on the Grand Staircase-Escalante National Monument is contained in UGS Circular 93, which can be purchased for $4.00 at the Natural Resources Bookstore at 1594 West North Temple, Salt Lake City, Utah 84116 [(801)537-3320]. Information is also available on the UGS home page at *http://www.ugs.state.ut.us.*

References

Allison, M.L., compiler, 1997. A preliminary assessment of energy and mineral resources within the Grand Staircase-Escalante National Monument: Utah Geological Survey Circular 93, 36 p., appendices.

Doelling, H.H.,1975, Geology and mineral resources of Garfield County, Utah: Utah Geological and Mineral Survey Bulletin 107, 175 p.

Doelling, H.H., and Davis, F.D., 1989, The geology of Kane County, Utah: Utah Geological and Mineral Survey Bulletin 124, 192 p. , 10 pls.

Hettinger, R.D., Roberts, L.N.R., Biewick, L.R.H., and Kirschbaum, M.A., 1996, Preliminary investigations of the distribution and resources of coal in the Kaiparowits Plateau, southern Utah: U.S. Geological Survey Open-File Report 96-539, 72 p., 1 pl.

Table 1. In-place mineral and energy resources within Grand Staircase-Escalante National Monument by county (after Allison, 1997).

Resource	Total within Monument	Portion within Garfield County	Portion within Kane County	Nature of Estimate	Comments (Source)
Coal	62.310 billion tons	27.713 billion tons	34.597 billion tons	Identified and Geologic	All coal beds greater than 1 foot. (Hettinger and others, 1996).
Coal	47.209 billion tons	17.012 billion tons	30.197 billion tons	*Identified*	*As above*
Coal	15.101 billion tons	10.701 billion tons	4.400 billion tons	*Geologic*	*As above*
Coal-bed Methane	2.63 to 10.51 TCF (trillion cubic feet)	.66 to 2.63 TCF (trillion cubic feet)	1.97 to 7.89 TCF (trillion cubic feet)	Geologic	Calculated using average gas content of 100 cu. ft./ton and 400 cu. ft./ton. (Allison, 1997)
Oil	200,000 to 400,000 bbls	200,000 to 400,000 bbls	none	Geologic	Remaining reserves in Monument portion of Upper Valley field. Based on current production assuming 3 to 6 year life.
Oil	270 million bbls	81 million bbls	189 million bbls	Hypothetical	Total based on percentage of oil-generating capacity of Chuar Group. County division based on county percentage of untested traps. (Allison, 1997)
Carbon Dioxide	1.0 - 4.0 TCF (trillion cubic feet)	1.0 - 4.0 TCF (trillion cubic feet)	Unknown, not tested	Geologic	(Allison, 1997)
Tar Sands	550 million bbls	550 million bbls	None	Geologic	(Allison, 1997)
Titanium Zirconium	1 to 3 million tons ore @ 4 to 14% zircon, 18 to 45% ilmenite-equivalent	80,000 to 300,000 tons ore	920,000 to 2,700,000 tons ore	Geologic	(Allison, 1997)
Uranium	30,000 to 50,000 pounds U_3O_8	30,000 to 50,000 pounds U_3O_8	none	Geologic	Circle Cliffs area only. Assumes discovery of 2 to 3 deposits downdip from similar deposits. Probably low grade: 0.10 to 0.20 percent U_3O_8.
Manganese	20,000 tons at 35% Mn	none	20,000 tons at 35% Mn	Geologic	(Allison, 1997)
Copper	9,000 tons at 5% Cu	6,000 tons at 3.5% Cu	3,000 tons at 8.0% Cu	Geologic	Erratic and discontinuous mineralization - probably sub-economic. Estimate from descriptions of known occurrences in Doelling (1975) and Doelling and Davis (1989).
Industrial Rocks and Minerals	Unknown				Present within the monument but no work done to date to evaluate size and nature of resources.

Identified:	Based on surface exposures and sufficiently close drilling - Reasonably assured resource with moderately well-established size.
Geologic:	Based on reasonable projection of surface exposures and samples but with little, if any, drill confirmation or assumption of discovery of deposits similar to those known in area - Reasonably assured resource but size and grade not well defined.
Hypothetical:	Based on geologic models and genetic concepts with little independent confirmation - Resource may or may not be present.