

DOE Office of Petroleum Reserves – Strategic Unconventional Fuels

Fact Sheet: U.S. Oil Shale Resources

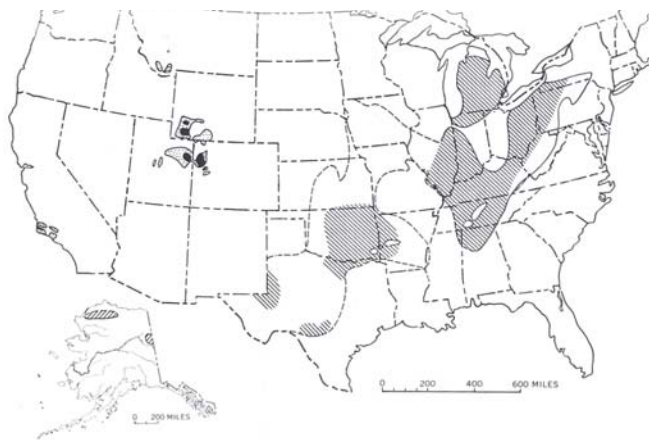
What is Oil Shale?

- U.S. western oil shale is carbonate rock, generally marlstone that is very rich in organic sedimentary material called “kerogen.” Eastern shales are more often silica based.
- Oil shales are “younger” in geologic age than crude oil-bearing formations; natural forces of pressure and temperature have not yet converted the sediments to crude oil.
- Kerogen can be converted to superior quality jet fuel, #2 diesel, and other high value by-products.
- The kerogen content of “oil shale” ore can range from 10 to 60 or more gallons of oil per ton.

Where is Oil Shale Found?

- The richest, most concentrated deposits are found in the Green River Formation in western Colorado, southeastern Utah, and southern Wyoming.
- Other significant, less concentrated deposits exist in the Devonian, Antrim, and Chattanooga shale formations in several eastern and southern states and parts of Alaska. (Figure 1)

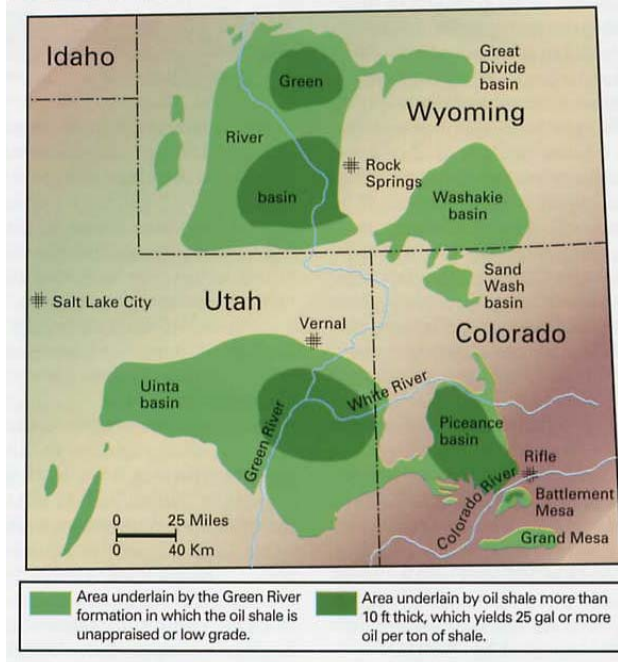
Figure 1 - Major U.S. Oil Shale Deposits



What is the Area of the Green River Formation?

- Oil shale underlies 17,000 square miles or 11 million acres in the Piceance (CO), Uinta (UT), Green River, Washakie (WY), and Sand Wash (CO) Basins. (Figure 2)¹
- The Piceance Basin, which contains more than 80 percent of the recoverable resources of the Green

Figure 2 – Green River Formation Oil Shale Deposits



River Formation, underlies a 35 mile by 35 mile (1,225 sq miles) area of western Colorado.

How Much Oil Shale Does America Have?

- America’s total oil shale resources could exceed 6 trillion barrels of oil equivalent. However, most of the shale is in deposits of insufficient thickness or richness to access and produce economically.

How Much Oil Shale Could Be Recovered?

- Potentially recoverable resources are generally deemed to be at least 15 feet thick and have potential yields of 15 gallons per ton or more.
- Oil shale yields more than 25 U.S. gal/ton are generally viewed as the most economically attractive, and hence, the most favorable for initial development. (Table 1)
- About 1.8 trillion barrels of shale oil are thought to reside in deposits greater than 15 gallons per ton in the Colorado, Utah, and Wyoming.

Table 1: U.S. Oil Shale Resource in Place (Bil Bbls)²

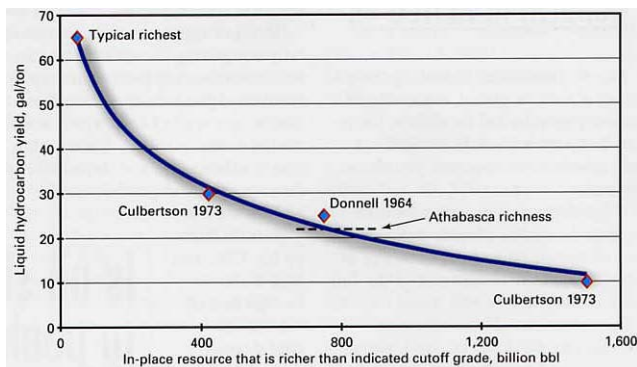
Deposits Location	Richness (gals/t)		
	5 - 10	10 - 25	25 - 100
Colorado, Wyoming & Utah (Green River)	4,000	2,800	1,200
Central & Eastern States	2,000	1,000	NA
Alaska	Large	200	250
Total	6,000+	4,000	2,000+

- The thickest and richest resources have the greatest technical recoverability and economic potential. (Table 2 and Figure 3³)

Table 2: Potentially Recoverable Oil Shale Resources (Green River Formation)⁴

Thickness (Feet)	Yield (Gal/t)	CO	UT	WY	Total
> 100	> 30	355	50	13	418+
15 – 100>	>15	840	270	290	1,400+
Total		1,200	320	300	1,820+

Figure 3: Resource Distribution by Richness



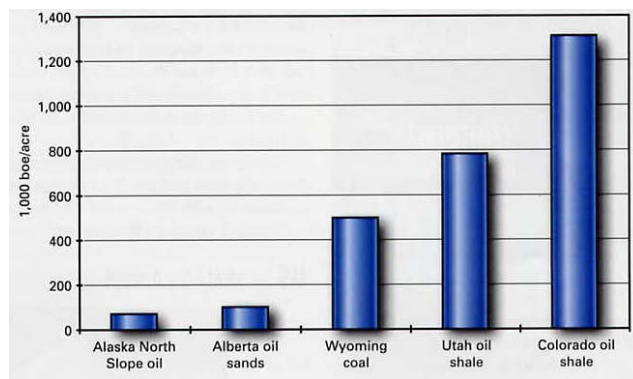
How Do We Know How Much Oil Shale Exists?

- More than a quarter million assays have been conducted on core and outcrop samples for the Green River oil shale.
- Results show that the richest zone, known as the Mahogany zone, is located in the Parachute Creek member of the Green River Formation. This zone can be found throughout the formation.
- Because of its relatively shallow nature and consistent bedding, the resource richness is well known, giving a high degree of certainty as to resource quality.

How Do U.S. Oil Shale Resources Compare with other U.S. and Canadian Energy Resources?

- U.S. western oil shales are more concentrated on a resource per acre basis than Alaskan North Slope oil or Alberta's tar sands. (Figure 4)⁵.

Figure 4: Areal Density of Selected Resources



Who Owns the Oil Shale Resources?

- The U.S. Government owns and manages about 73 percent of the lands that contain significant oil shale deposits in the west. Federal lands contain about 80 percent of the known recoverable resource in Colorado, Utah, and Wyoming.
- As on 1978, private company ownership of oil shale lands in Colorado, Wyoming, and Utah totaled about:
 - 21 percent of the Piceance Basin (CO)
 - 9 percent of the Uinta Basin (UT)
 - 24 percent of the Green River Basin (WY)
 - 10 percent of the Washakie Basin (WY).⁶
- State governments and localities and Native American Tribes also own oil shale lands.

For More Information, Contact:

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References

¹ Reproduced from *Oil & Gas Journal* "Is Oil Shale America's Answer to Peak-Oil Challenge?" Pennwell Corporation, August 9, 2004
² Duncan, D.C. and V.E. Swanson: "Organic-Rich Shales of the United States and World Land Areas, U.S.G.S. Circular 523, 1965; as reported in U.S. Office of Technology Assessment, "An Assessment of Oil Shale Technologies" 1980.
³ Reproduced from *Oil and Gas Journal*, August 9, 2004
⁴ U.S. Office of Technology Assessment "An Assessment of Oil Shale Technologies, 1980, p. 92, Table 14)
⁵ Reproduced from *Oil and Gas Journal*, August 9, 2004
⁶ U.S. Office of Technology Assessment "An Assessment of Oil Shale Technologies, 1980