

Paleogene Lake-Margin Coals in Early Freshwater Lacustrine Sections of Lakes in the Green River, Uinta, and Piceance Basins, Wyoming, Utah, and Colorado

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ABSTRACT

Low-rank coals were deposited in lake-margin settings during the Paleogene in the Washakie, Uinta, and Piceance Basins during the early freshwater lake stages in the Green River Formation. The thickest, most extensive coals were deposited in broad marginal mires that developed during restricted phases of the lakes. Marginal lacustrine coal beds in the Uinta Basin were buried deeply enough to have generated hydrocarbons and are thought to have sourced some of the oil in that basin. Previous work has shown that immature samples of these Uinta coals can be relatively hydrogen-rich (hydrogen indices > 300 mg/g), contain bitumen with a high pristine/phytane ratio (> 3), and consist primarily of vitrinite macerals. Similar marginal lacustrine coal beds in the Piceance Basin may be the source of minor waxy oil deposits found there. It is possible that there may also be coal-generated oil in the Washakie Basin. These coals have been shown to be highly oil-prone as determined by the Fischer assay method, with liquid oil yields as high as 79 and 40 gallons per ton (GPT) in the Uinta and Washakie Basins, respectively. The Washakie coals are high in sulfur (up to ~9 wt. %), which is significantly higher than sulfur contents for coals from the other basins (~1 wt. % or less). Total organic carbon (TOC) content and programmed pyrolysis analyses of Washakie coals from core show that the hydrogen indices (HI, 150- 360 mg/g) for many samples meet geochemical criteria for possible oil generation (HI > 200 mg/g). An example of relative source rock quality is highlighted in a 402 ft thick section of marginal (near zero oil yield) lacustrine rock within the Washakie 01A core. The section contains only 27.7 ft of scattered coal beds with an average Fischer assay oil yield of 23.1 GPT, but has the same potential as 122 ft of offshore lacustrine oil shale that continuously averages 5.25 GPT. These results reinforce previous reports of oil potential from Paleogene coals found in these and other lacustrine basins within the Rocky Mountain region and may warrant further investigation.