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Potential Oil-Prone Areas in the Cane Creek Shale Play, Paradox Basin, Utah, U.S.A., Identified by Epifluorescence Techniques

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Potential oil-prone areas in the Cane Creek shale, Pennsylvanian Paradox Formation, were identified in the Paradox Basin, southeastern Utah, based on hydrocarbon shows recognized using low-cost epifluorescence (EF) techniques on cuttings and core. The Cane Creek has produced over 5 million BO and 4 BCFG from naturally fractured and overpressured dolomitic siltstones and dolomites interbedded with anhydrite and organic-rich marine shales. Since the 1990s, horizontal drilling has been used to successfully develop the Cane Creek tight oil play.

EF microscopy enables better imaging of poorly preserved grains and textures. In addition, EF provides information on diagenesis, pore types, and organic matter (including “live” hydrocarbons) within sedimentary rocks. It is a rapid, non-destructive procedure that uses a petrographic microscope equipped with reflected-light capabilities, a Hg-vapor lamp, and appropriate filtering. Samples from four cores (a producer and three dry holes) provide a template for selection of drill cuttings and calibration of EF shows. Approximately 1800 cutting samples were evaluated from over 30 wells penetrating the Cane Creek shale throughout the region. The wells include four producers, one with cumulative production of >1 million BO from the Cane Creek since its completion in 1962. The dolomites in these cuttings (generally 10 representative samples per depth interval from each well) display intercrystalline porosity, microporosity, and microbial constructional pores. A qualitative visual rating (a range and average) based on EF evaluation was applied to the group of cuttings from each depth interval in each well. The highest average and maximum EF rating from each well were plotted and mapped.

As expected, productive wells (fields) are distinguished by their generally higher EF ratings. However, an area of moderate fluorescence (indicating probable capacity of some oil production if there is adequate porosity and permeability) is indicated within the lower Cane Creek shale in the central part of the southwestern Paradox fold and fault belt whereas the northeastern part shows a regional trend of low EF. This implies that hydrocarbon migration in Cane Creek dolomite beds was along regional northwest-trending faults and fracture zones, and created a potential oil-prone area that to date is relatively untested.