



## Power of XRF and high-resolution shades of grey profiling in characterizing Duvernay properties

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### Abstract

The use of XRF and of shades of grey profiles has been tested on one long Duvernay cored section and more than four hundred drill cuttings samples pertaining to two Duvernay horizontal wells.

From a 54 meter long Duvernay core, very high resolution images at 35 microns per pixel have been analyzed to extract a shade of grey profile. The latter has helped define a detailed sequence stratigraphy as minima and maxima clearly show trends that can be related to changes occurring in neighboring wells at the same stratigraphic levels.

The study looked at differences in output and usefulness of shades of grey profiles between various core photography set-ups, i.e. between high resolution (200 microns per pixel) using traditional lab photo equipment and very high resolution photos (35 microns per pixel) taken on a rolling bench with a shutterless camera. The results have delivered a series of criterias and patterns useful to recognize lighting issues that would minimize the usefulness of shades of grey profiles.

On extensive collections of drill cuttings, shades of grey have been extracted using a line scanner at a resolution of 200 microns per pixel. Ten successive XRF measurements for each cutting vial allowed for statistical analysis of 26 elements and gave a solid data set to evaluate the shade of grey approach. These ten XRF measurements per vial were compared to single XRF values from a handheld XRF device to outline similarities and differences link to the tools. Prediction of total organic carbon was then tested using the two sets of XRF mentioned and Leco TOC done on many of the samples.

Additionally, the study generated a series of workflows to test frac placement prediction using XRF data (elements, ratios and multilinear regression). The important point is to be able to strengthen the analysis by analyzing frac stages that would have limited facies changes as evidenced by XRF; thus, stages that would saddle two very different lithologies should not be incorporated in the initial learning data set.

Both XRF and shades of grey can be extremely useful to geologists and engineers to better understand what will make a good hydraulic frac, but calibration and quality control are essential. Even core photos from commercial labs may have to be checked before interpreting.