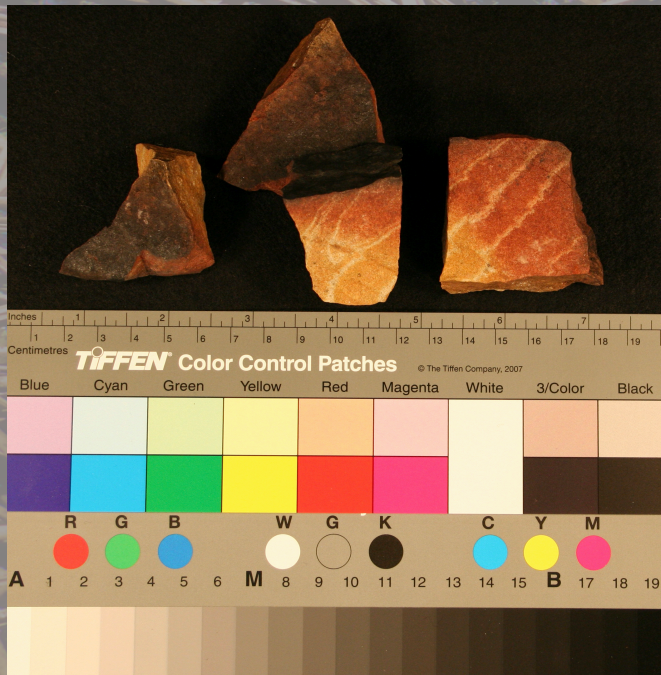


Fire Temperature Reconstruction: Analysis of Kaibab Formation colour alteration to laboratory testing and heat exposure from the 2020 Mangum Fire, Arizona

OBJECTIVE

This project aims to numerically record changes in colour and physical properties of the Kaibab Formation in relation to heat exposure with the intent of applying to forest fires..



Sandstone from a high severity fire in Colorado. The formation is unknown, but the exterior has been baked black with a gradation of colour change towards the center.



Field map showing historic fires denoted in different coloured polygons with labels of the name of the fire and date of burn. The outcrops where the samples were collected are marked by blue dots.

BACKGROUND

The June 2020 **high-severity Mangum fire** ignited 71,000 acres of Ponderosa Pine forest on the **Kaibab Plateau**, near the North Rim of the Grand Canyon. The rock formation dominantly affected by the fire was the Permian Kaibab Formation, specifically the **Harrisburg Member** which is composed of varying units of marine evaporites, chert and siliciclastics.



Close up of sample MAN-061321-M4-RX showing colour alteration from Mangum Fire. Similar colour changes can be seen in the Kaibab. The colour of the surface with direct exposure is 5Y2.5/1 and transitions from 5YR8/3 into 2.5YR7/4.



Sample outcrop along Highway 67, Arizona. Note the light tan sandy limestone.

METHODS

Using the **Munsell colour scheme** prior to being baked in a **muffle furnace** the samples will be heated in increments of **50 °C intervals** up to 700°C. At first the rock samples will be held at set temperatures for 1 hour. Based upon these results the experiment times and temperatures will evolve to stimulate a diverse set of wildfire conditions. Other observations such as a decrease in **HCl effervescences** and **rock spalling** will be noted as potentially related to low grade metamorphism in response to heat exposure. Laboratory-induced thermal **colour alteration will be compared** to the rocks collected from high and medium-low severity burn areas of the Mangum Fire as a proximate for fire temperature.