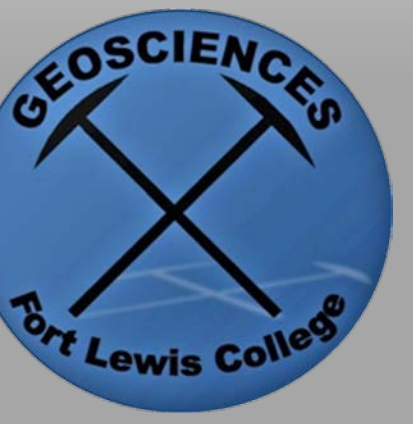


OSL dating of glacial outwash sediment in the Klondike Quarry, Colorado

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Abstract

Three samples were taken from the Klondike Pit in Disappointment Valley, Colorado for optically stimulated luminescence age dating. Samples were gathered from a vertical transect bottom to top and were dated at 163.7 ± 32.1 , 146.6 ± 29.3 , and 97.1 ± 18.4 ka respectively. Field observations show evidence of sedimentary structures commonly associated with glaciofluvial processes. The presence of unconsolidated cobbles with interbedded fine sands are an indication of a braided river system which is the common fluvial system found within glacial outwash deposits.

Introduction

The Klondike Pit is a gravel quarry located at the base of the San Juan Mountains in Southwest Colorado near Disappointment Valley. The Bull Lake Glacial Maximum has been dated at 85-160ka in the San Juan Mountains. The pit has lenses of fine grain sand embedded within large river cobbles. These sands met the requirements needed for OSL dating techniques. In this study OSL samples were gathered from three sand lenses from the bottom, middle, and top of the wall. Samples were sent to Utah State University Luminescence Laboratory to be dated.

Background

Optically stimulated luminescence is a well-established exposure dating technique using fine grain silica rich sediments (quartz & feldspars). Glacial outwash systems are formed by the release and transportation of sediment from a glacier. The runoff of water from glacial melt creates a fluvial system capable of transporting a large volume of sediment. Common outwash sediments include unconsolidated fine sand lenses embedded with large rounded cobbles. Dates of Bull Lake Glacial maximum are gained from the analysis of deep marine sediments containing oxygen isotopes ^{16}O and ^{18}O . The relative abundance of these isotopes helps determine paleoclimate that can then be correlated with glacial events.

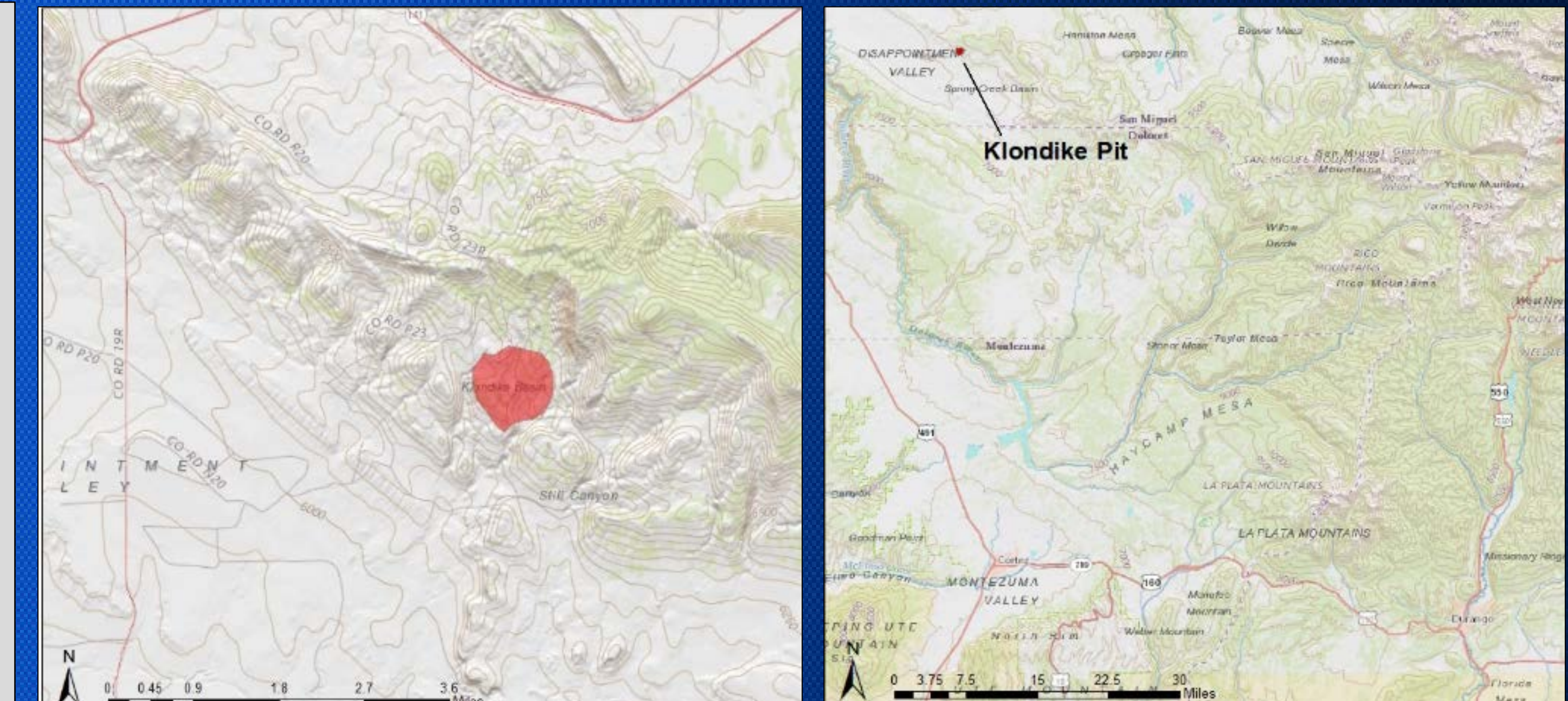


Figure 4. (Top Left) Large scale map of Klondike Pit. (Top Right) small scale map showing closest major city. (Bottom) Map of Klondike Quarry showing proximity to closest glaciated mountains during Bull Lake (44.0 Miles).

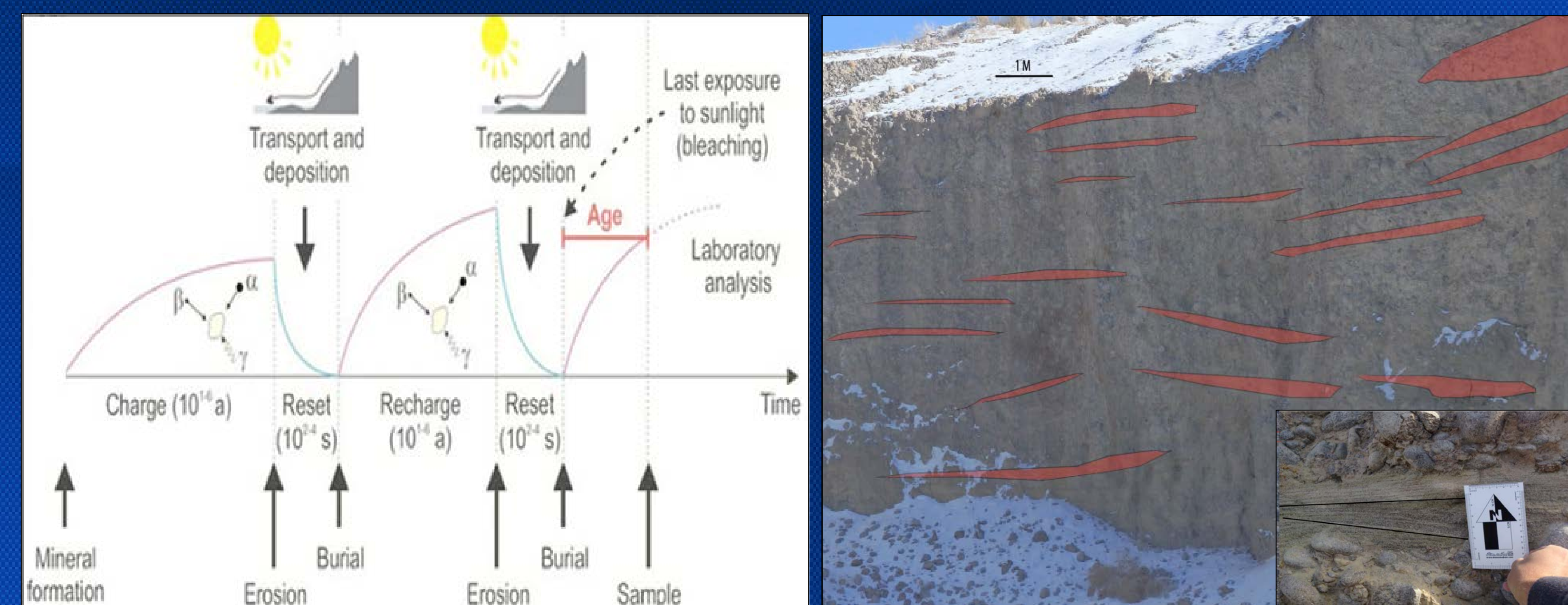
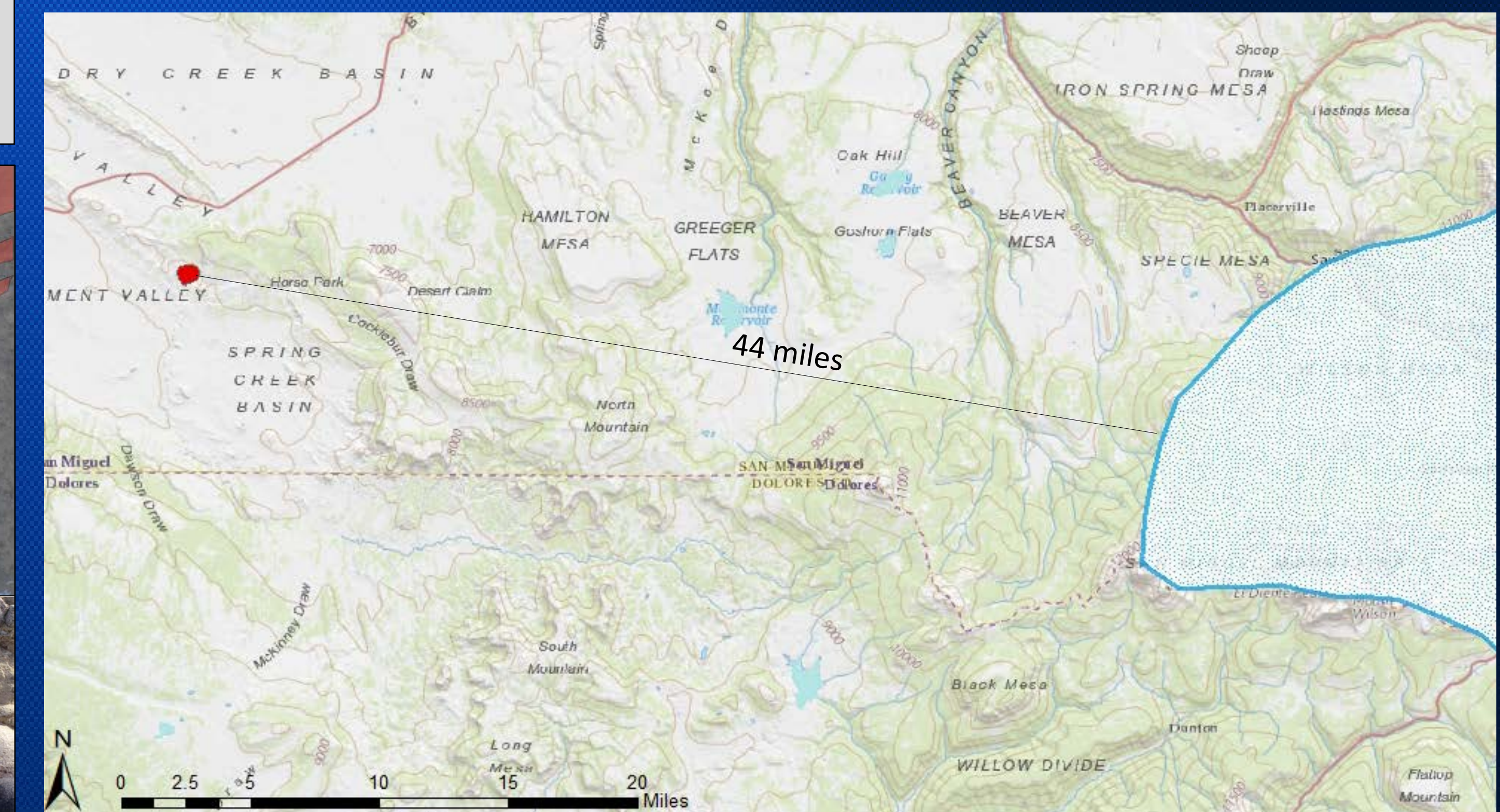


Figure 2. OSL is a dating method that can be used to date sediment <500 ka. This differs from many other dating methods, it records the time of sediment burial, not the age of the clast.



Figure 3. Map of pit wall highlighting lenses of fine grain material. Inset picture showing sedimentary structures.



Conclusion

Exposure dates of fine sediments from a vertical transect in the Klondike Pit were dated at 163.7 ± 32.1 , 146.6 ± 29.3 , and 97.1 ± 18.4 ka. These dates fall within the Bull Lake Glacial period. Due to the sedimentary structures found within the Klondike pit along with ages gathered from the OSL dates it can be concluded that these deposits represent a glacial outwash system from the Bull Lake Glacial maximum.

References Cited

Anderson, P.I and, Kenny, R. 2015 OSL Dating of Fluvial and Lacustrine Sediment north of Durango, Colorado: A Record of an Asynchronous Glacial Advance at 55KA?: Geologic Society of America, Rocky Mountain Section 67th Annual Meeting.
 Zhixiong Shen, Torbjörn E. Törnqvist, Whitney J. Autin, Zenon Richard P. Mateo, Kyle M. Straub, Barbara Mauz, 2012 Rapid and widespread response of the Lower Mississippi River to eustatic forcing during the last glacial-interglacial cycle.: Geological Society of America, 10.1130, p.124.

Discussion

The Klondike pits has a well cut outcrop face exposing a cross section of the glacial outwash lobe. The quarry face exposes a range of sediment size between lenses and are laterally continuous up to 10m, pinching out at the margins.

- Rounded cobbles from 5cm to 1m in diameter
- Lenses of very fine grain sand and silt (0.062-0.088mm)
- Lenses of medium to coarse grain sands (0.25-0.50mm)

The pit face is composed of cobbles sourced from the heavily glaciated San Juan Range. The immature sands making up the lenses were composed of quartz and other volcanic lithics. This sands are poorly sorted and sub-angular. Many sedimentary structures were also present in the face. These structures were consistent with those observed in known braided river deposits that have been associated with glacial outwash deposits.

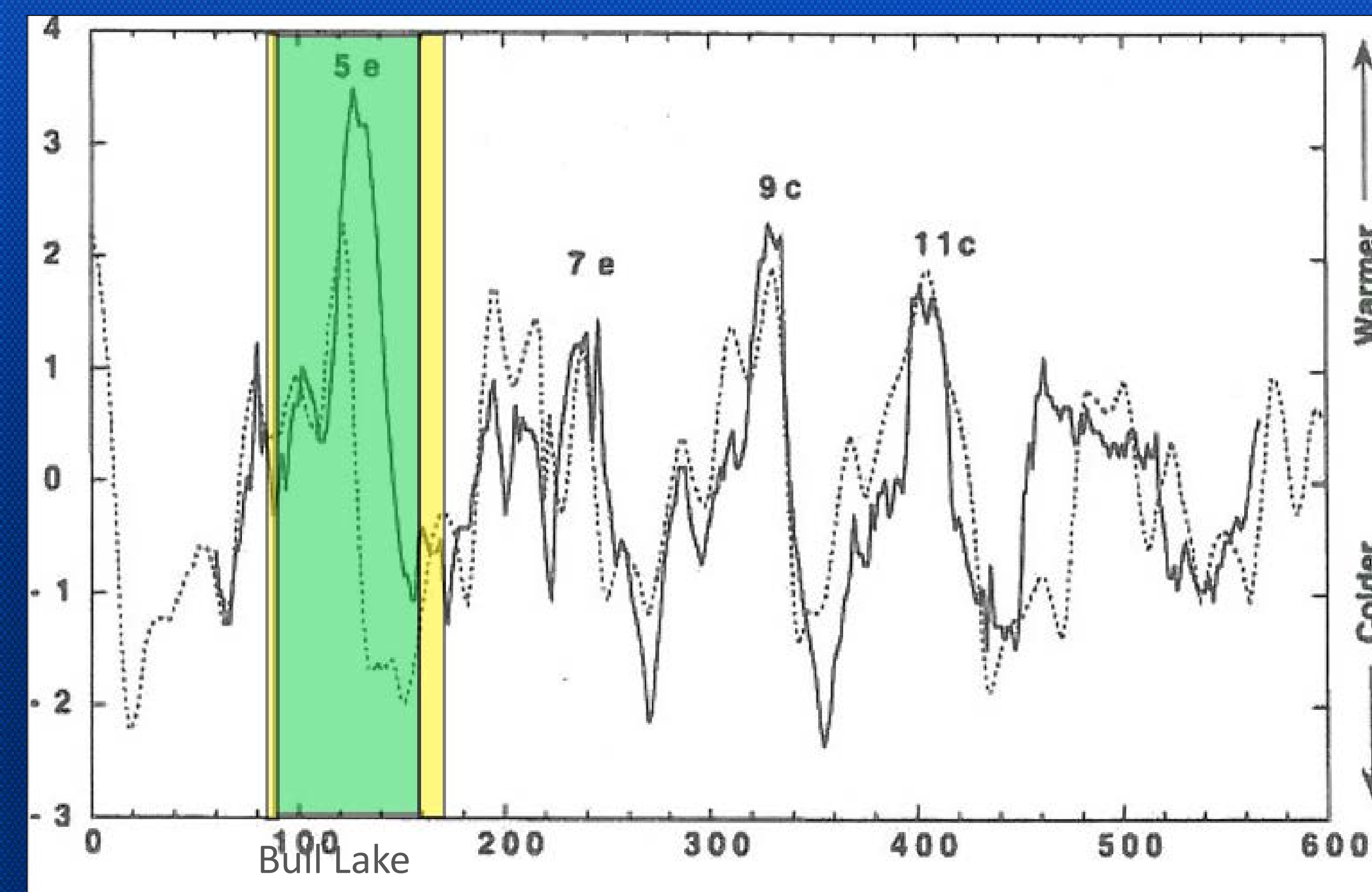


Figure 1. OSL ages of Klondike Pit plotted against MIS chart to show correlation between sampled ages and known glacial period. Error bars for ages shown in yellow.