



GEOCHEMICAL SIGNATURE OF THE PERMIAN-TRIASSIC TRANSITIONAL ENVIRONMENT, PINE FOREST RANGE, NEVADA

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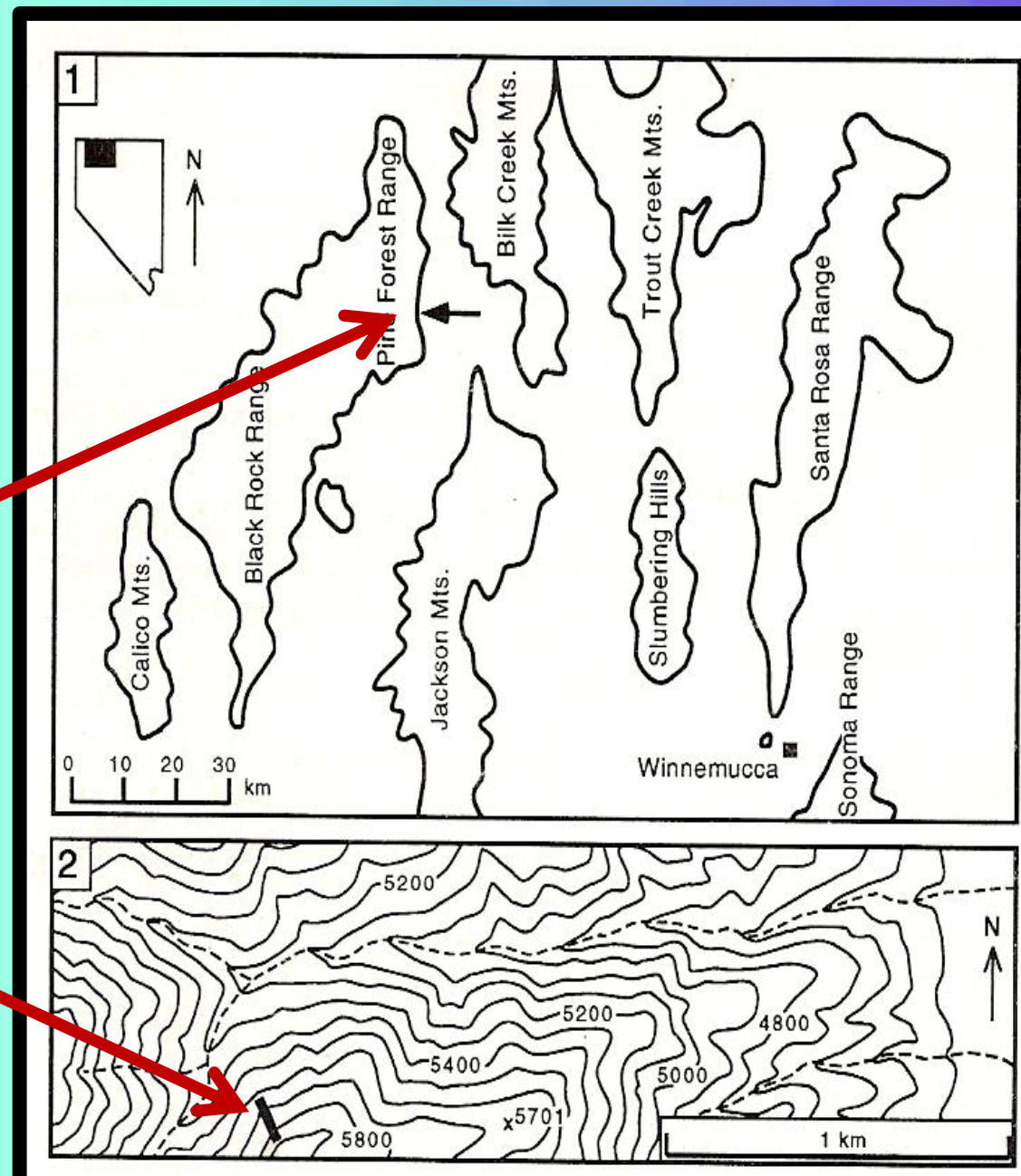
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ABSTRACT

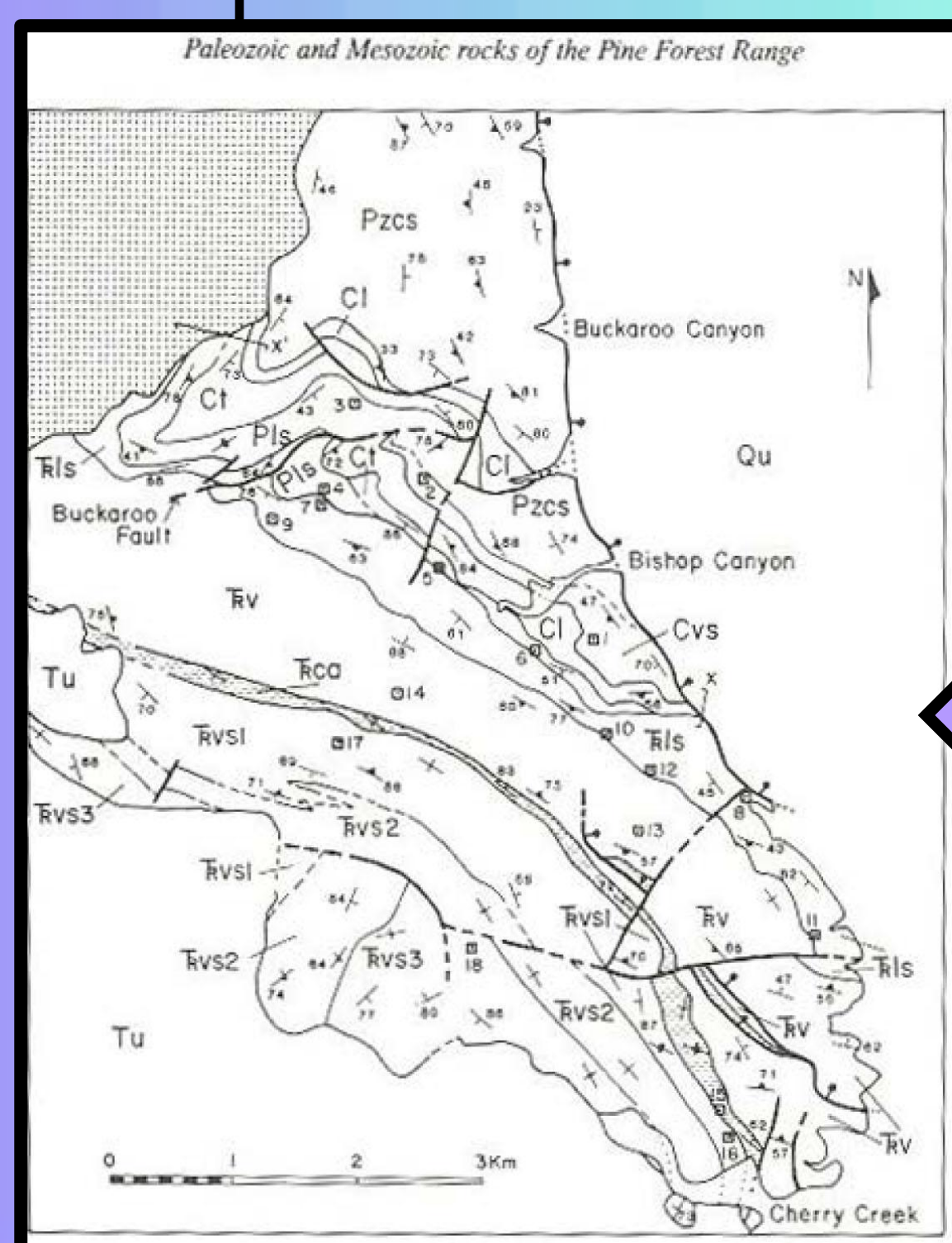
The history of Earth has been shaped by a handful of mass extinction events that have dramatically shifted the course of life on this planet. The most severe of these occurred approximately 250 million years ago at the end of the Paleozoic era. The transition during the Permian-Triassic (P-Tr) interval saw devastation on a global scale that has no equal in all of the Phanerozoic. The causes of the end-Permian extinction event remain elusive and intensely debated due to the rarity of intact and accessible P-Tr boundaries. Proposed catalysts include, but are not limited to sea level fluctuation, large-scale volcanism, and oceanic anoxia. The accreted terranes of Northwestern Nevada contain a conformable P-Tr boundary section within the Pine Forest Range that is comparable to other localities of the same age range. Results generated by the SAIC Exploranium GR-320 Portable Gamma Ray Spectrometer (Th/U) on previously collected samples from the unnamed formation in the Pine Forest Range support hypotheses regarding the onset of global anoxic conditions during the end of the Permian. In order to explore these consistencies in more detail, the presence of certain rare earth elements (REE) will be analyzed by the use of an Inductively Coupled Plasma (ICP) mass spectrometer. The ratio of $(Ce/La)_N$ and a negative Ce anomaly have been shown to indicate similar environmental conditions at the time of deposition. The concentrations of other REE such as La, Ce, Nd, Sm, Eu, Gd, Tb, Yb, and Lu, have exhibited characteristic patterns in the rocks found in other P-Tr boundary localities (Shukla et al., 2002). Preliminary results of this study include REE concentrations in the Pine Forest Range samples that may show similar patterns to those recorded from the same age strata found elsewhere.

LOCATION & GEOLOGY



Location map of Pine Forest Range and Buckaroo Canyon within Humboldt County, Nevada. Measured section marked on maps as arrow (upper) and black bar (lower). Figure from Yancey, Strong & Hanger (2000).

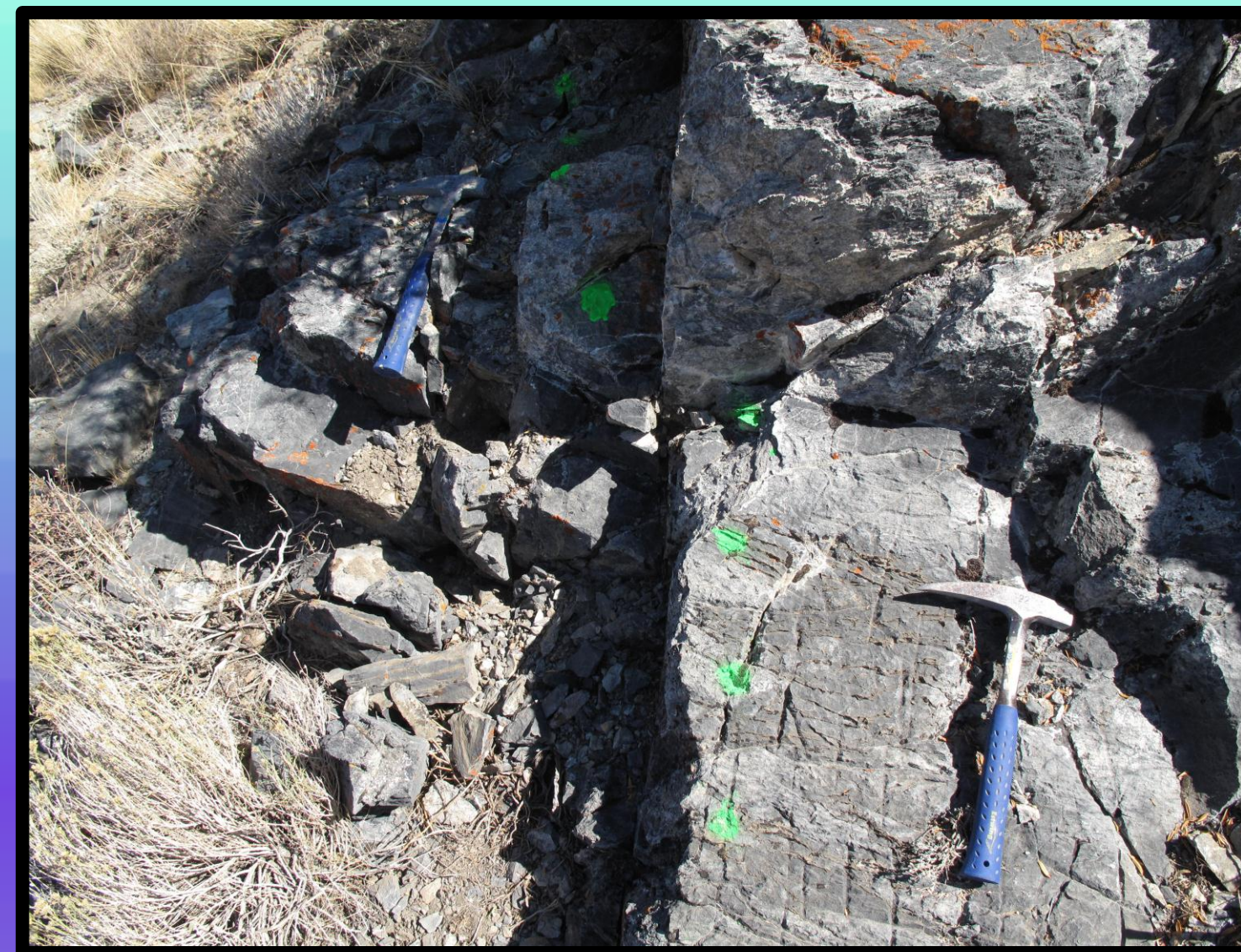
Geologic map of the southern end of the Pine Forest Range, showing adjacent undefined Permian limestone (PLs) and Triassic limestone (TRIs). (Wyld, 1990).



METHODOLOGY



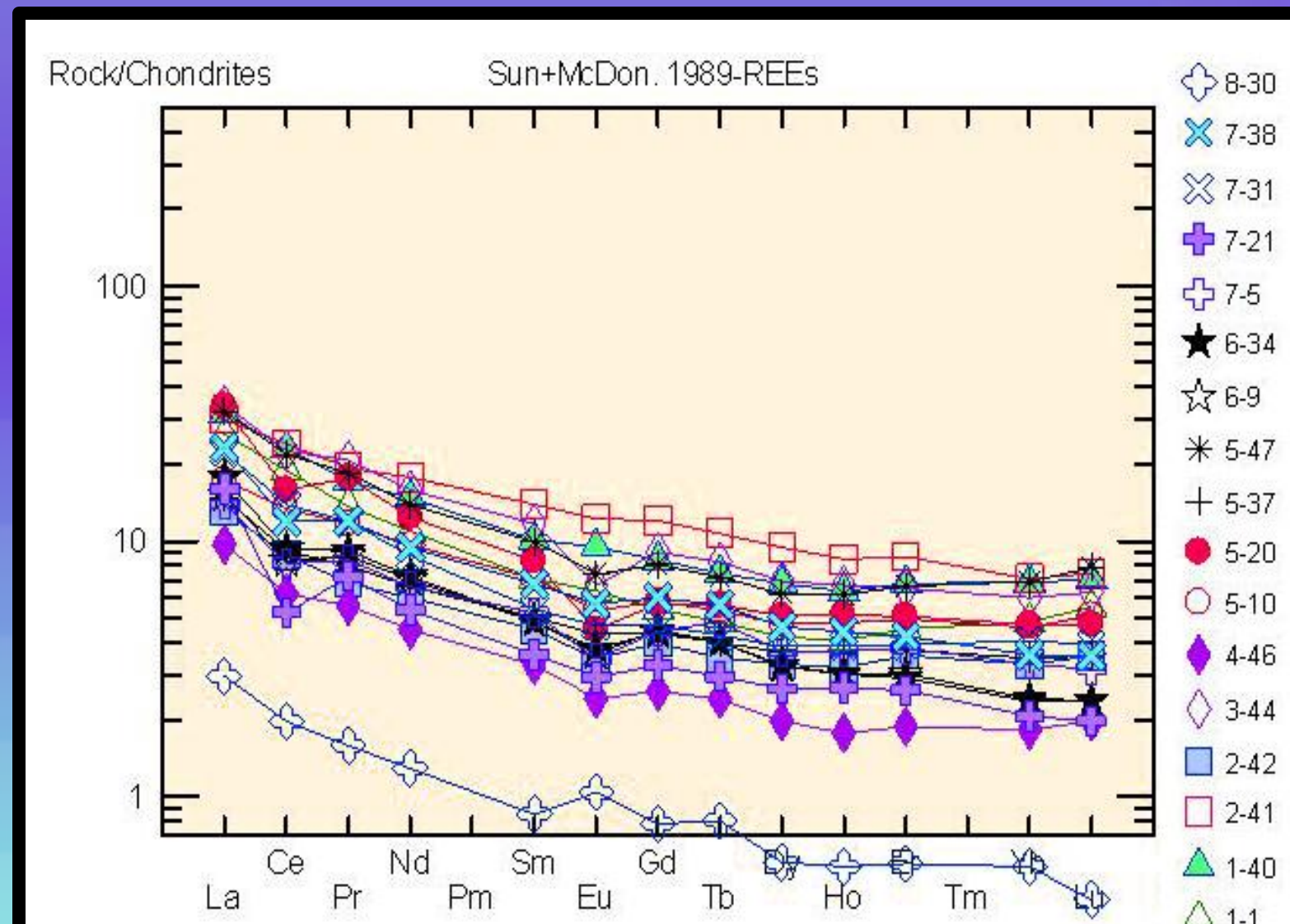
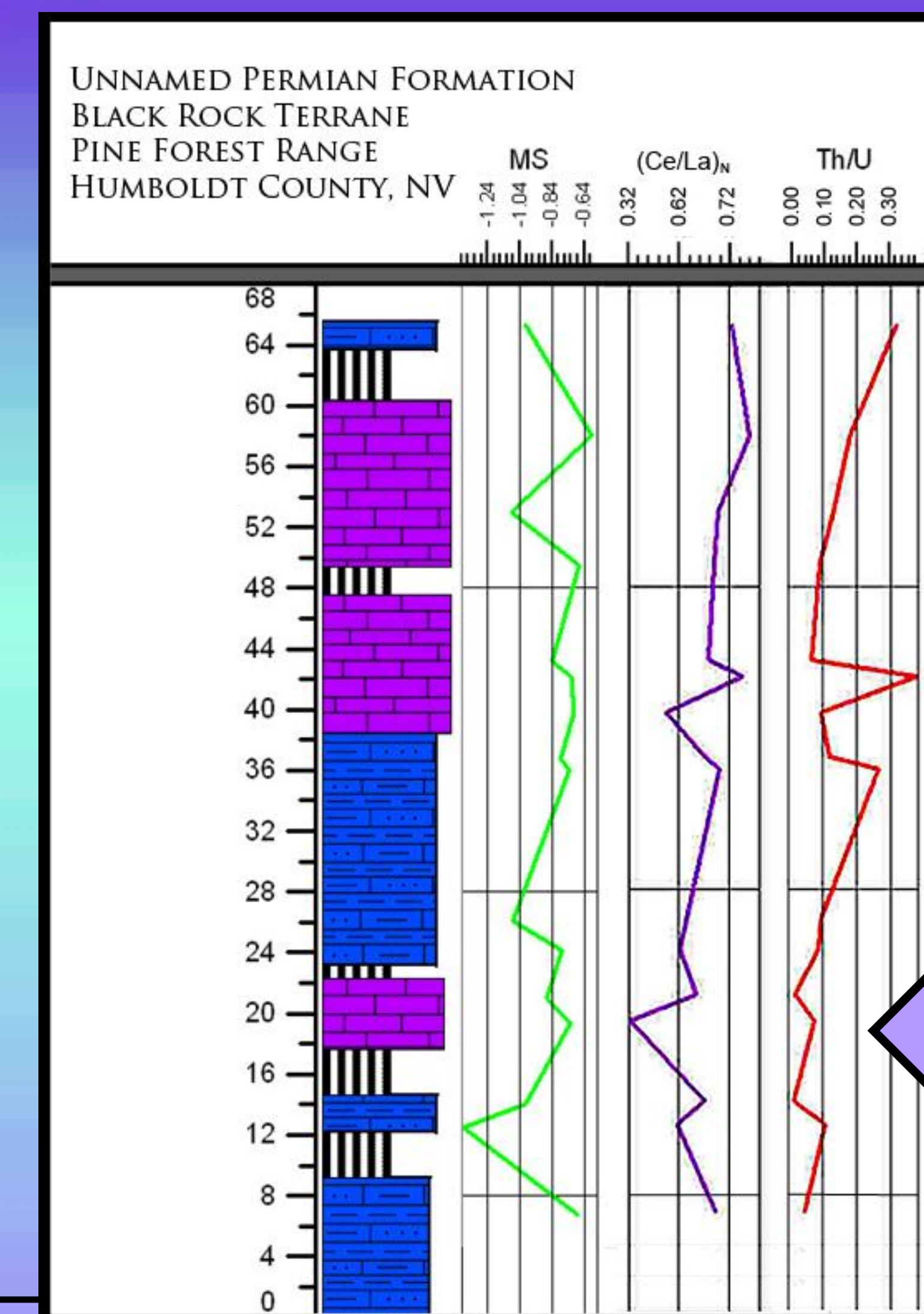
UW-Whitewater geology students traveled to the unnamed limestone formation in order to collect rock and fossil samples in addition to performing on-site data collection (magnetic susceptibility). Samples were returned to the lab on the UW-Whitewater campus.



Rock samples were pulverized and prepared for further analysis. Each sample underwent a lithium-borate fusion prior to acid digestion, then was analyzed for REE and trace elements via ICP-MS.



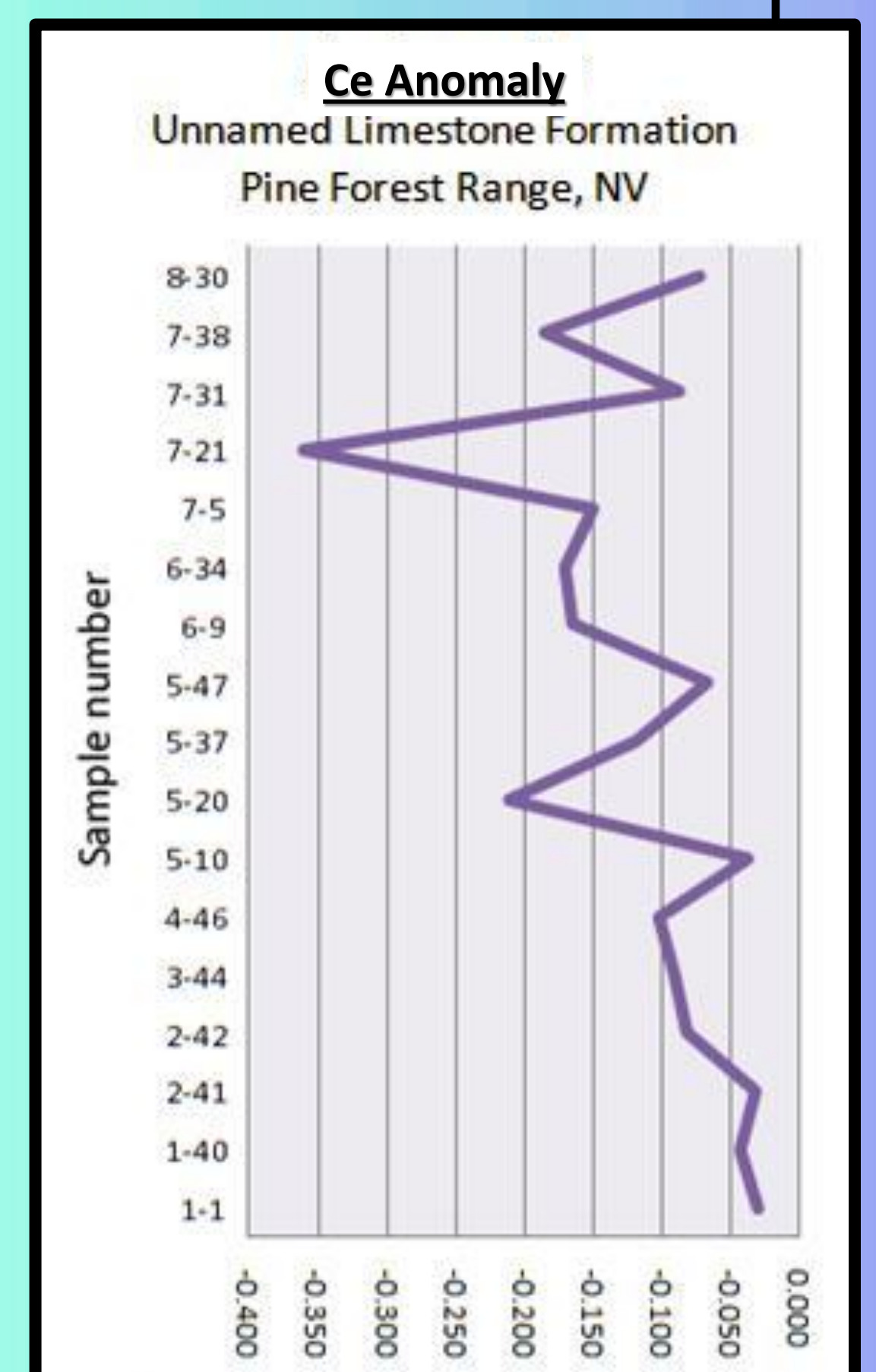
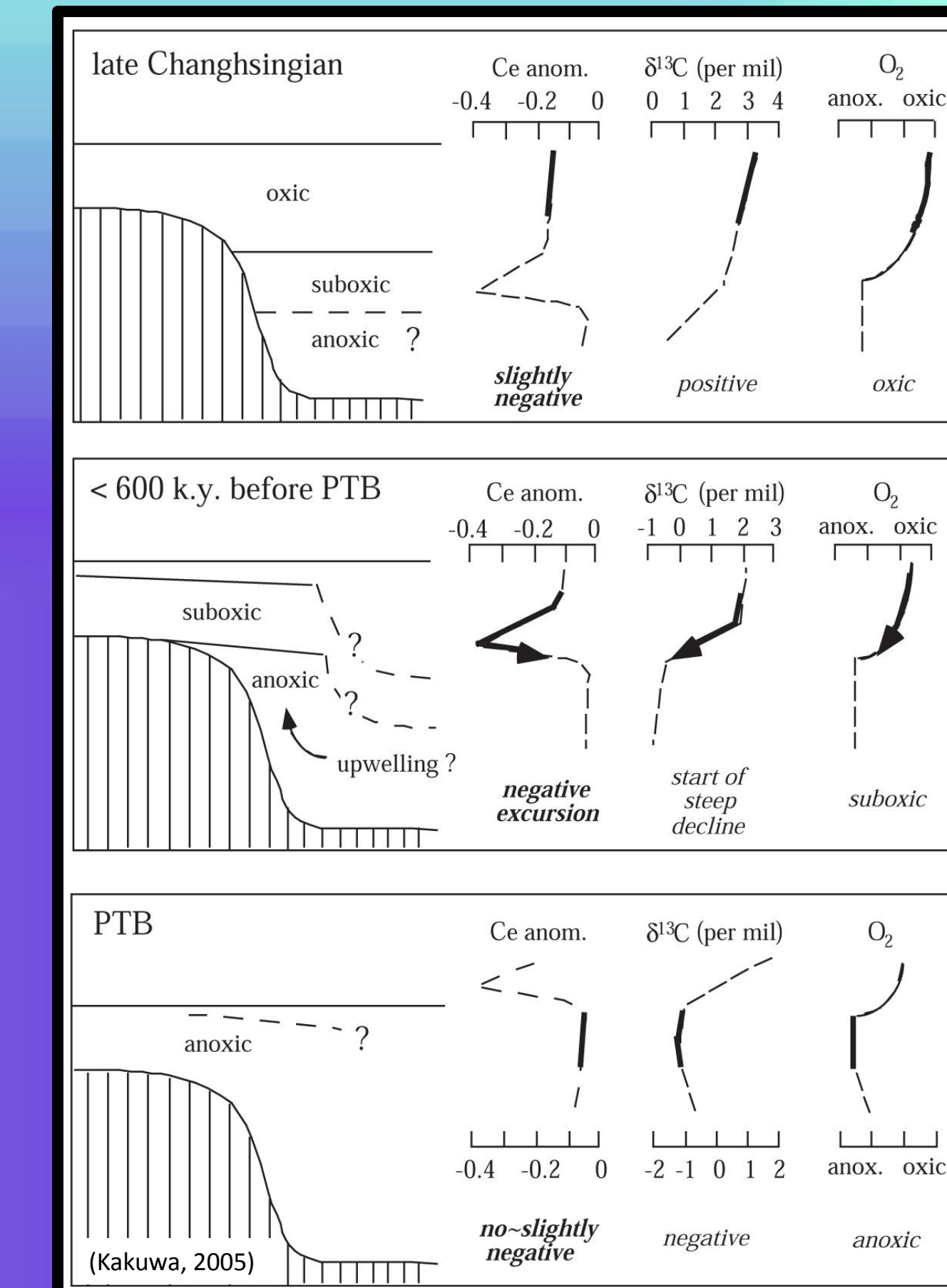
RESULTS



Chondrite-normalized REE values of the Pine Forest Range sections, with the exception of the youngest layer, show a slight negative Eu anomaly.

Magnetic susceptibility data displays diamagnetism characteristic of a depositional environment far from a mainland detrital source. Trends of Th/U and chondrite-normalized Ce/La support the hypothesis of anoxic conditions (Shukla et al., 2002).

CERIUM ANOMALY



The presence of a negative Ce excursion has been recorded in sediments deposited in anoxic environments. It can be calculated by $\log(Ce)_N - \log(Ce)$ where $\log(Ce) = (4\log(La)_N + \log(Sm)_N)/5$ (Kakuwa, 2005).

FUTURE WORK

The next phase of this project will focus on obtaining more solid age control for this section of the Pine Forest Range. Previously-collected samples in addition to those to be collected during a return to the site will be processed in acetic acid in order to expose and identify any index fossils (namely conodont elements) that will be used for biostratigraphic analysis.

ACKNOWLEDGEMENTS

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- Materials were collected on BLM lands in Humboldt County, Nevada.
- Several UW – Whitewater students aided in collecting rocks from the site via the Geology 492 (Field Studies in Geology) course.
- ALS Minerals Division analyzed the samples.
- Dr. Prajukti (juk) Bhattacharyya (UW-W) provided access to software necessary to create the spider diagram.

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