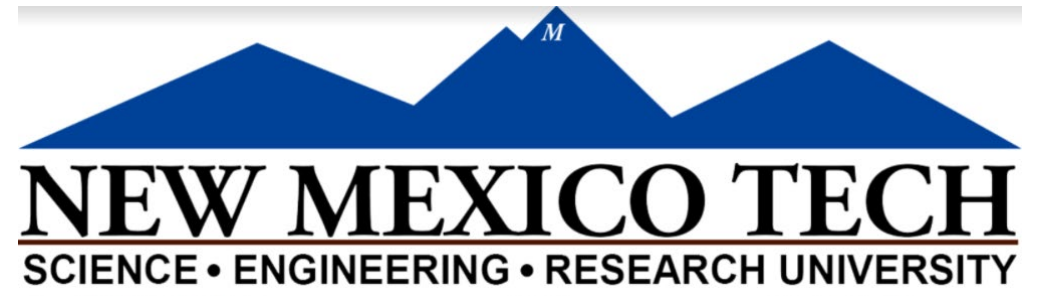
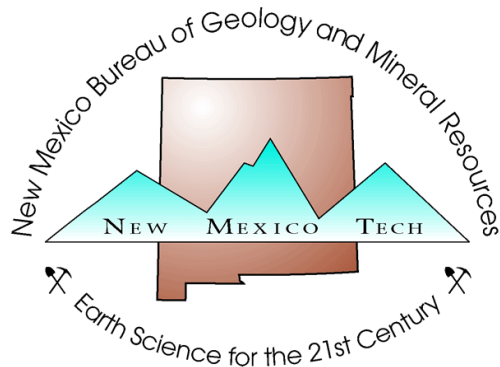


A stream-sediment geochemical survey for Critical Minerals in the Zuni Mountains, Cibola and McKinley Counties, New Mexico

Virginia T. McLemore, Evan J. Owen, Brielle Hunt,
and the Exploration Geochemistry Class of Fall 2023

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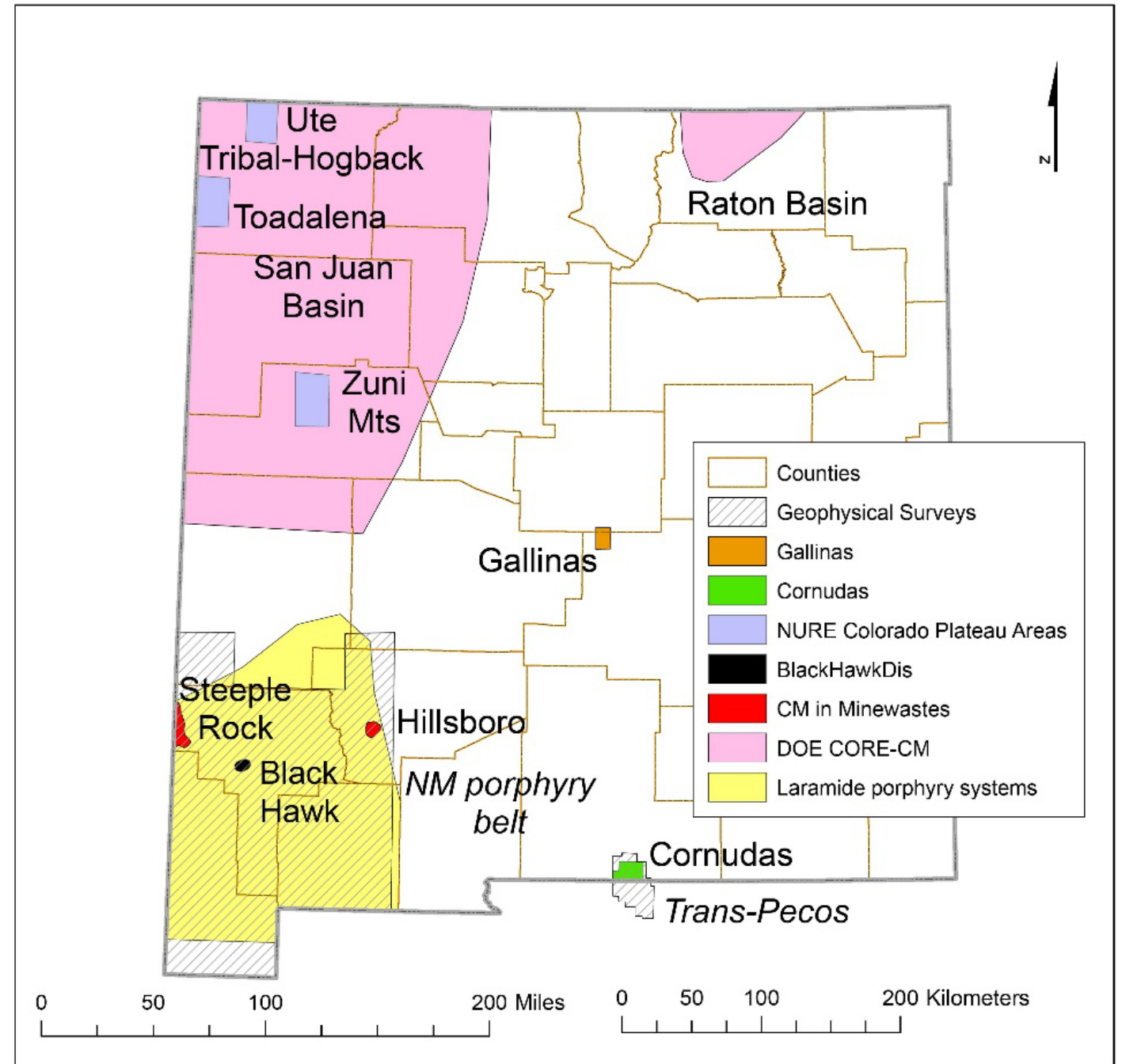
Acknowledgements

- Funding
 - U.S. Geological Survey National Geological and Geophysical Data Preservation Program (NGGDPP, G23AP00332, G22AS00033)
 - USGS Earth Mapping Resources Initiative (EARTH MRI) program (G23AC00561)
 - NMBGMR, Mike Timmons Director and State Geologist
- Fall Exploration Geochemistry Class (17 students)
 - Multidisciplinary—including geology, geochemistry, biology, mineral engineering students
 - Various levels of experience
- Professional staff and many students who worked on these projects, especially collecting samples
- **Note: Many photographs in this presentation were taken by the class**

Exploration Geochemistry Class of Fall 2023

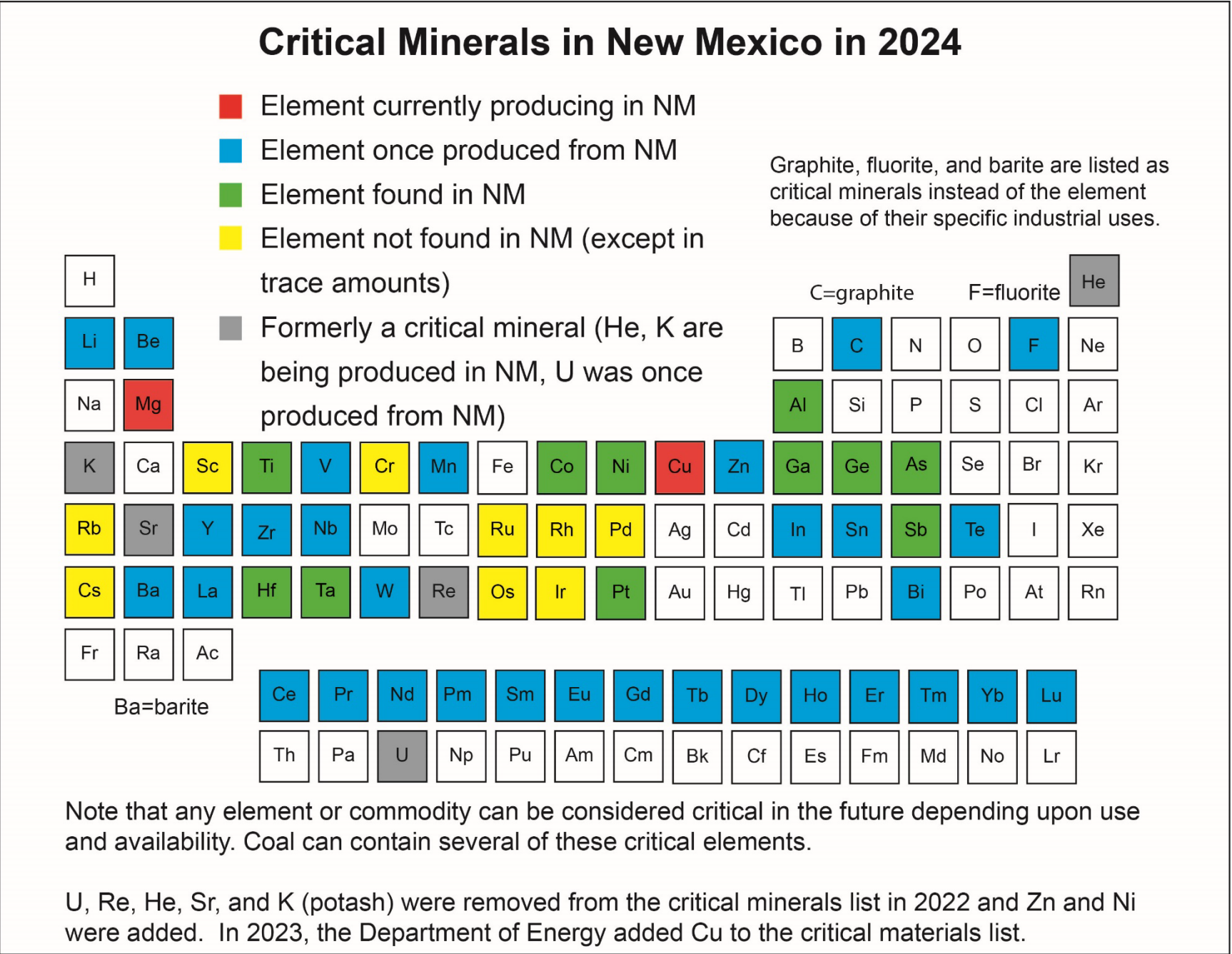
- Evan Owen
- Charles Kershaw
- Zohreh Motlagh
- Mark Leo-Russell
- Jakob Newcomer
- Ernest Brakohiapa
- Eric Ruggles
- Devlon Shaver
- Kyle Stafford
- Brielle Hunt
- Isabella Sanchez
- Oscar Scholten
- Abena Acheampong-Mensah
- Anita Appah
- Maria Beltran Marquez
- Jairo Montana Atencio
- Jeremy Giannone

USGS Earth MRI and DOE CORE-CM projects in New Mexico



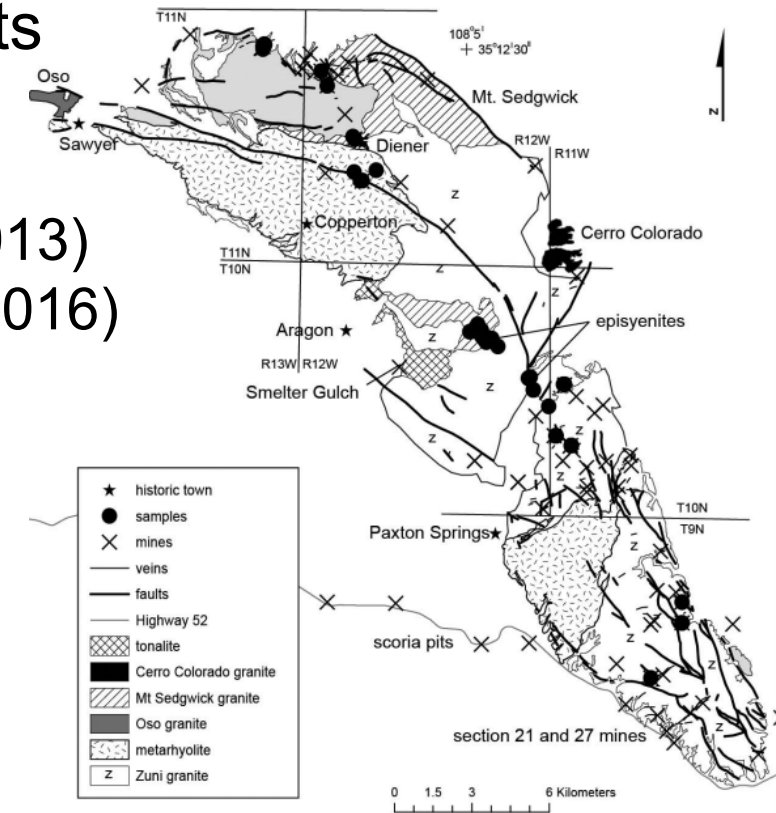
Periodic table showing Critical Minerals in New Mexico

- Minerals needed for military, industrial or commercial purposes that are essential to renewable energy, national defense, medical devices, electronics, agricultural production and common household items
- Minerals that are essential for use but subject to potential supply disruptions



Why the Zuni Mountains?

- Source areas for sedimentary deposits in the San Juan Basin (U, V, coal, beach placer sandstones, petroleum)
- USGS focus areas for potential critical minerals deposits
 - Zuni Mountains PGE (SW_New_NM_074a)
 - Zuni Mountains fluorspar (SW_New_NM_074b)
 - New Mexico Cambrian alkaline rocks and REE veins (SW013)
 - New Mexico-Texas-Colorado sediment-hosted Cu (SW_P4016)
- Deposit types
 - Veins and replacements in Proterozoic rocks
 - Copper veins in Proterozoic rocks
 - Potential Platinum Group Elements (PGE)
 - One of the few areas in New Mexico with ultramafic rocks
 - Potential pegmatites
 - Fluorspar veins
 - REE-bearing episyenites
 - Sandstone-hosted stratabound, sedimentary-copper deposits
 - Mica
 - Iron deposits



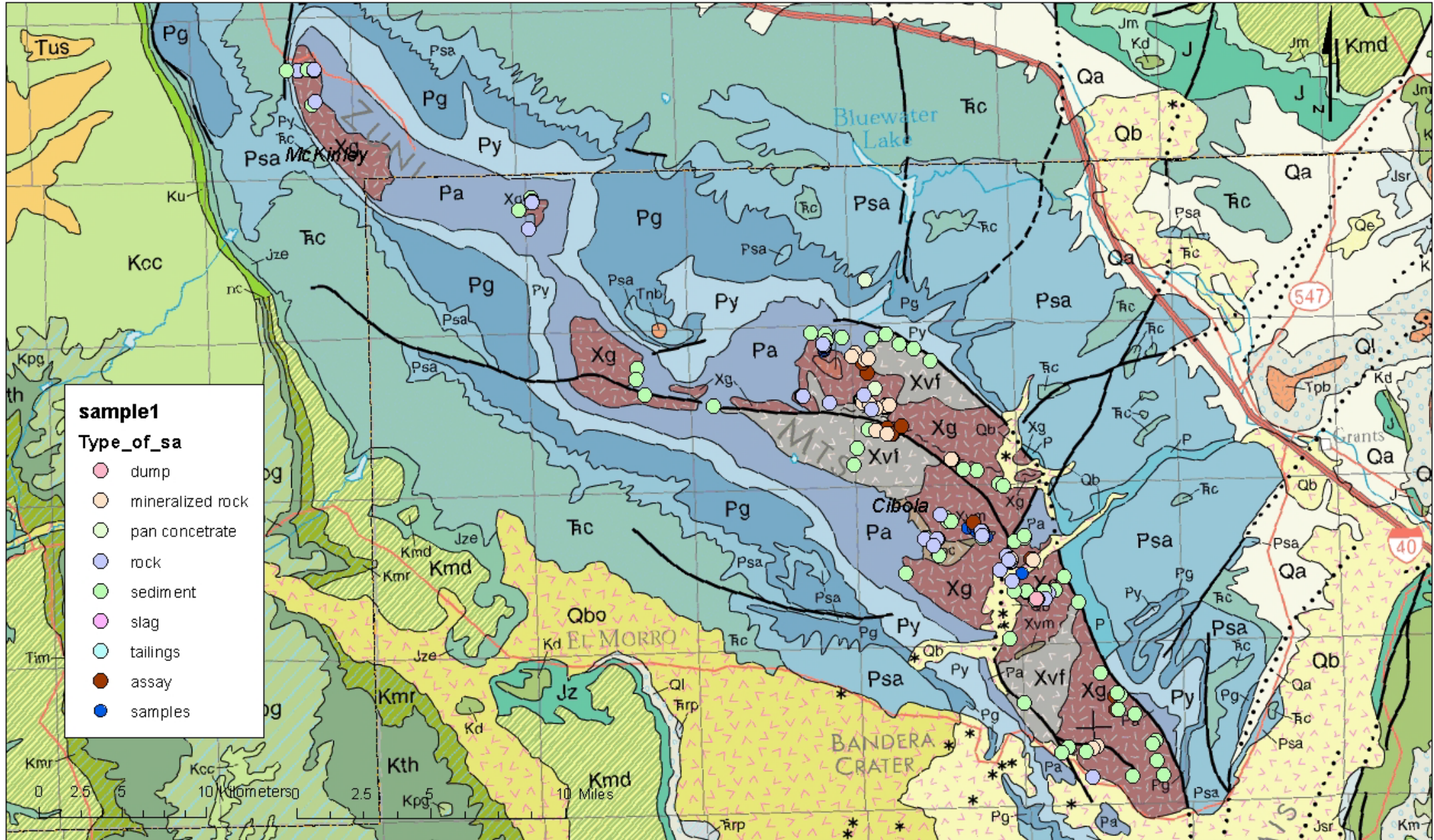
McLemore (2013)

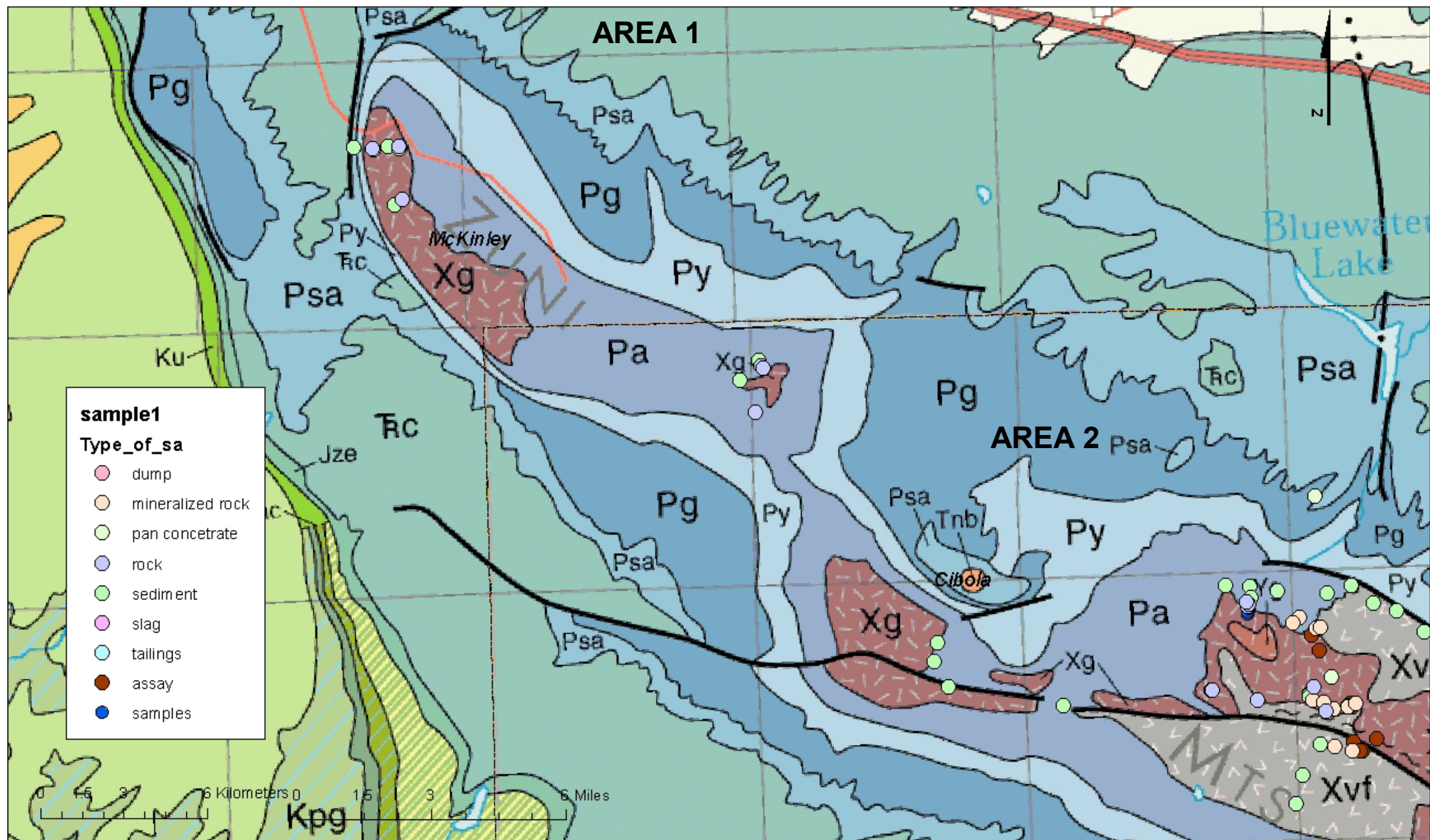
Details of class project

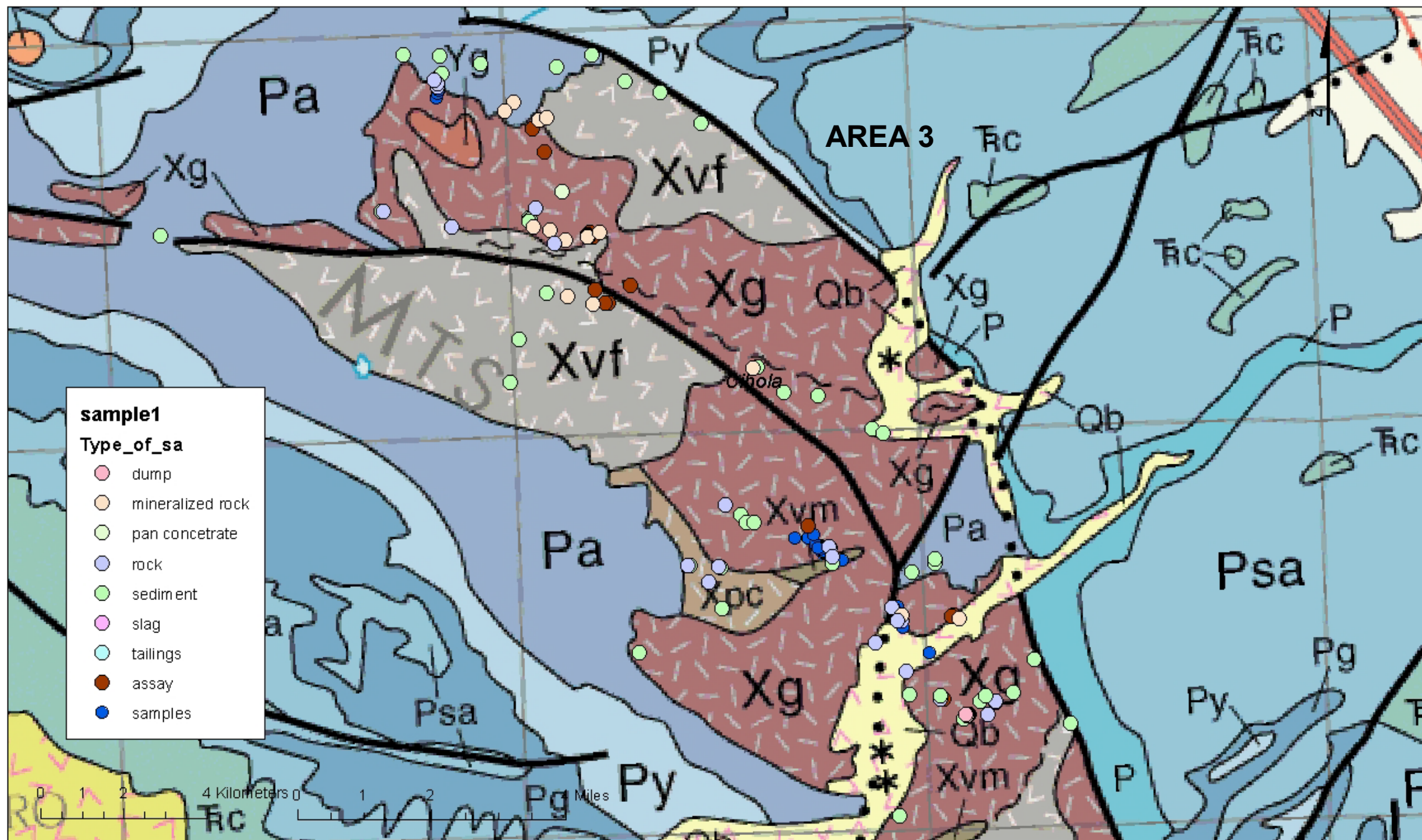
- Divide class into 5 teams with a team leader
- Collect stream sediments in August
- Begin to write the technical report
- This will be a guide for other states to follow
- One MS student will continue with the project for their thesis

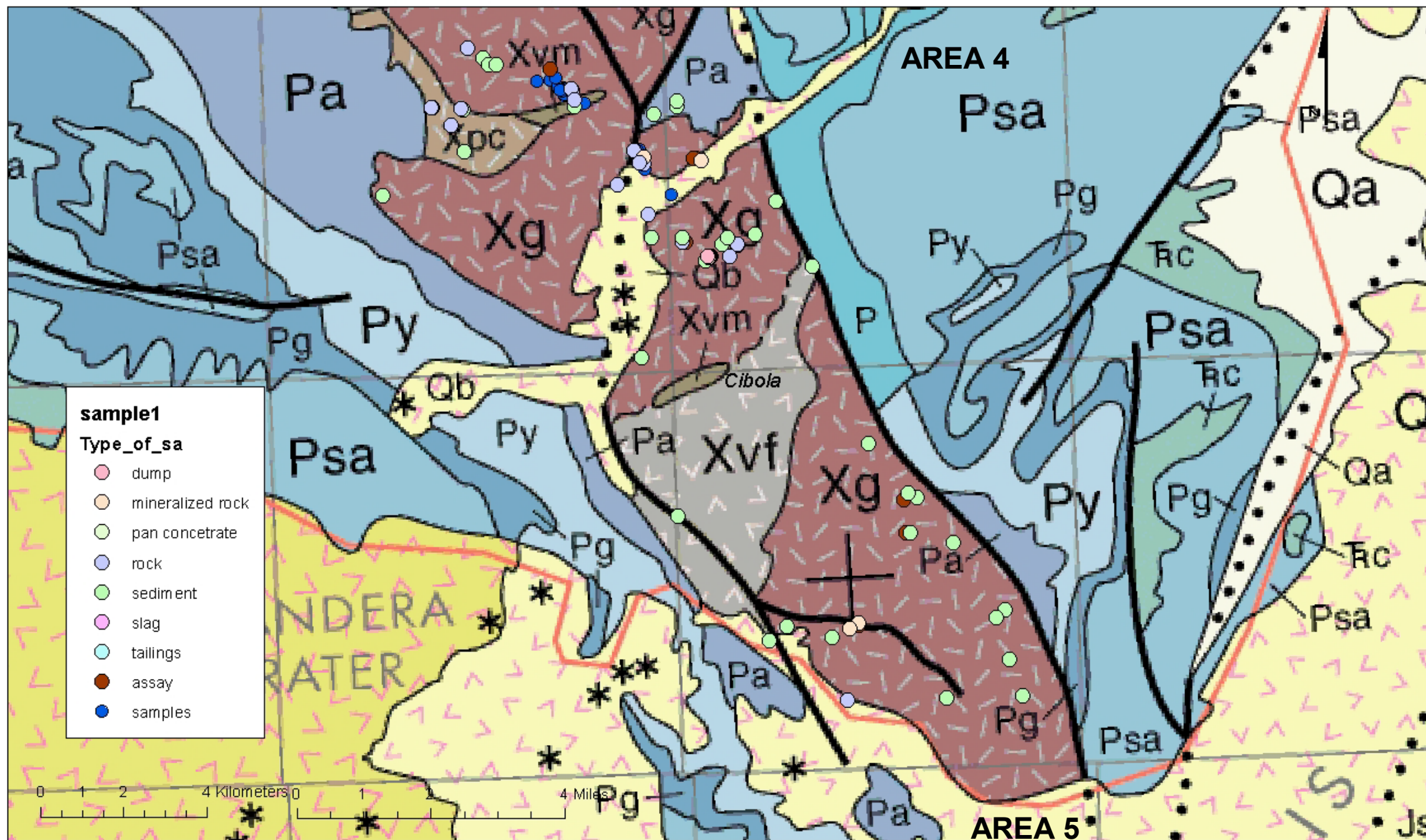
summary	number
sediment	81
pan con	2
rocks	37
mineralized rock	50
dump	4
tailings	1
slag	1
total	176

Location of all samples collected from the Zuni Mountains







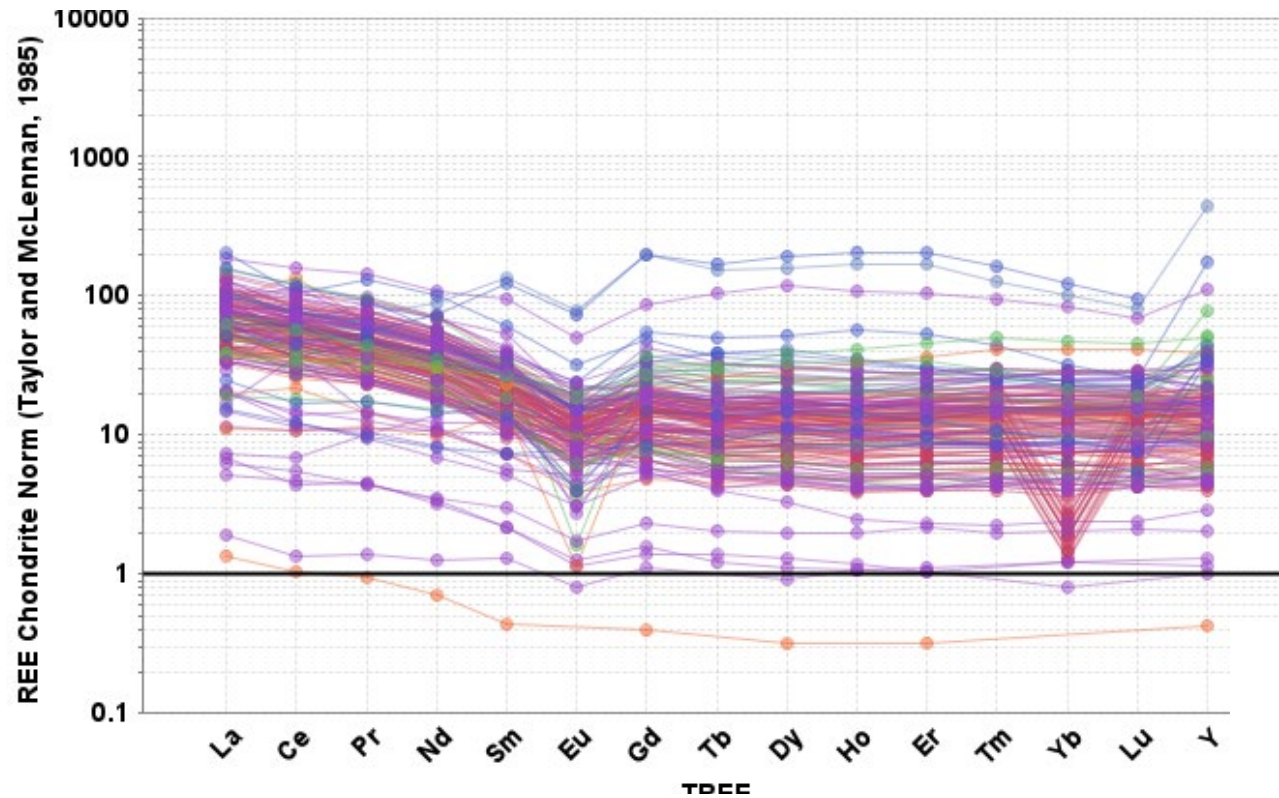


Sampling Methods

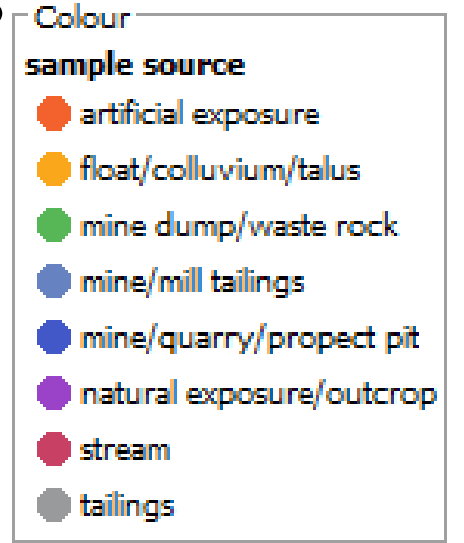
- Find best exposed/least vegetated stretch of the river bed
- Record coordinates and information on sample site in field book
- Fill bucket with 2-3 shovels of sediment approximately every foot
 - Sieve the sediment with <2 mm sieve
- When bucket is approximately half full, mix sediment
- Fill 1 bag for chemical analyses, 2 bags for archive
 - 1/2 to 2/3rds full
- Take a photo of sample site with samples
- Clean shovel, sieve, and bucket with wipes
- Collect mineralized and unmineralized samples using hammer



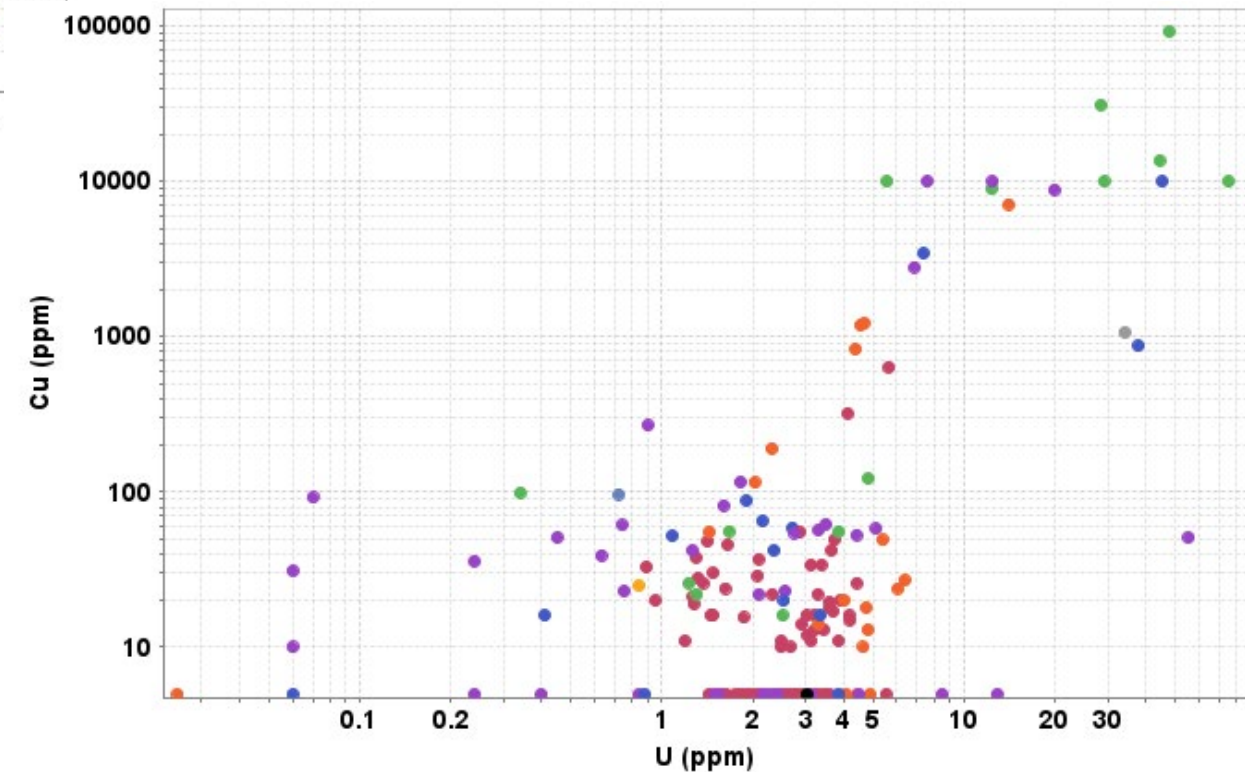
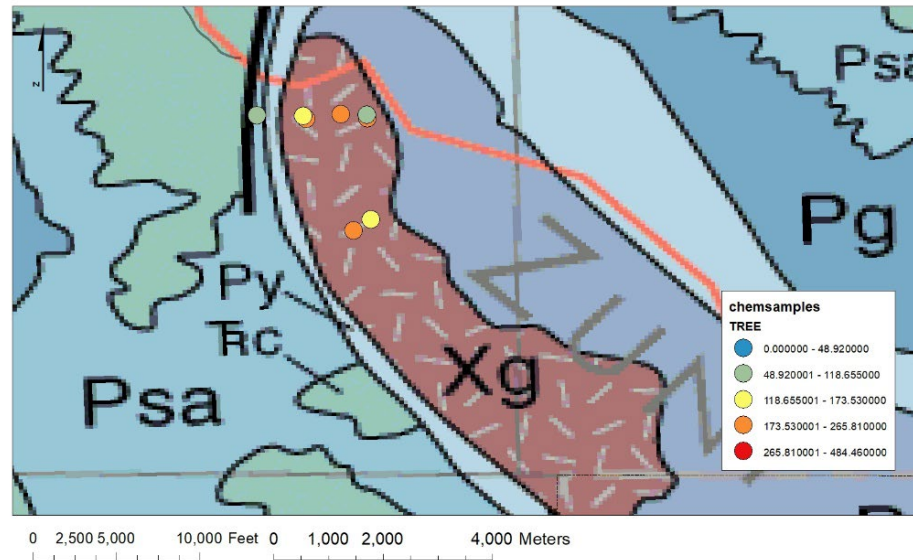




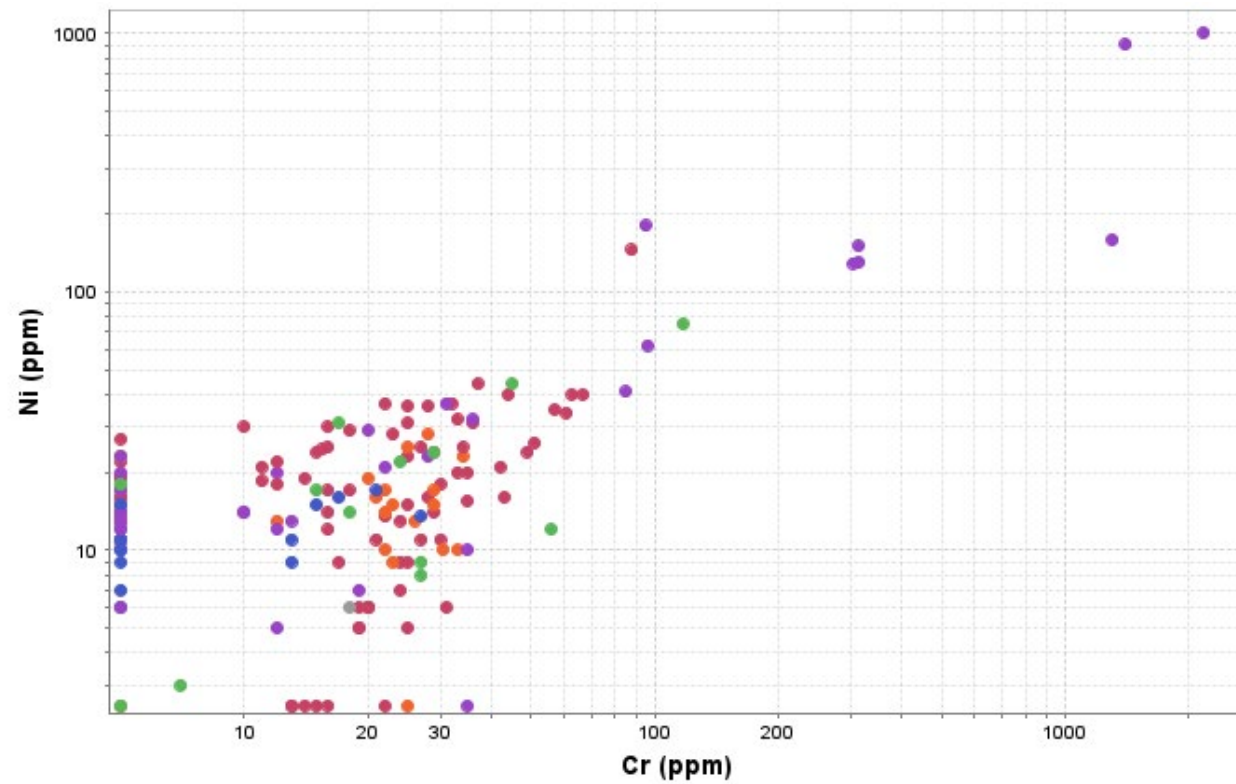
Preliminary Results



TREE
in
Area 1

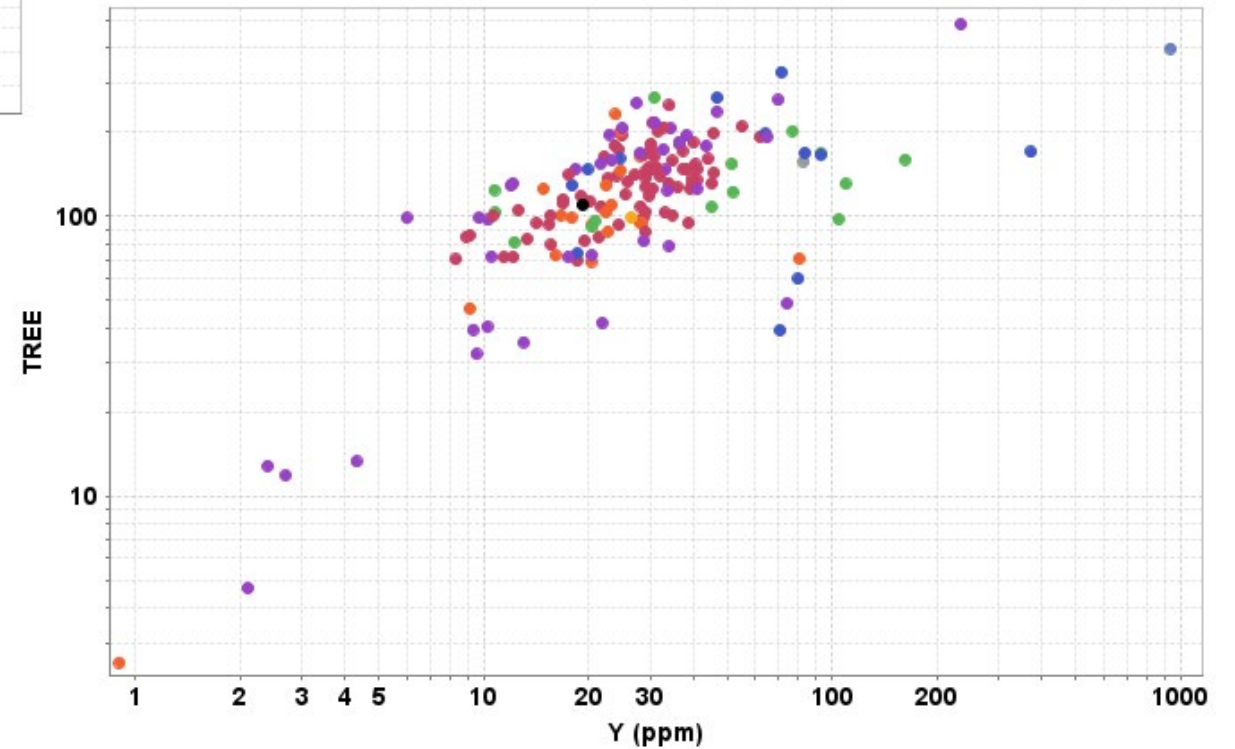
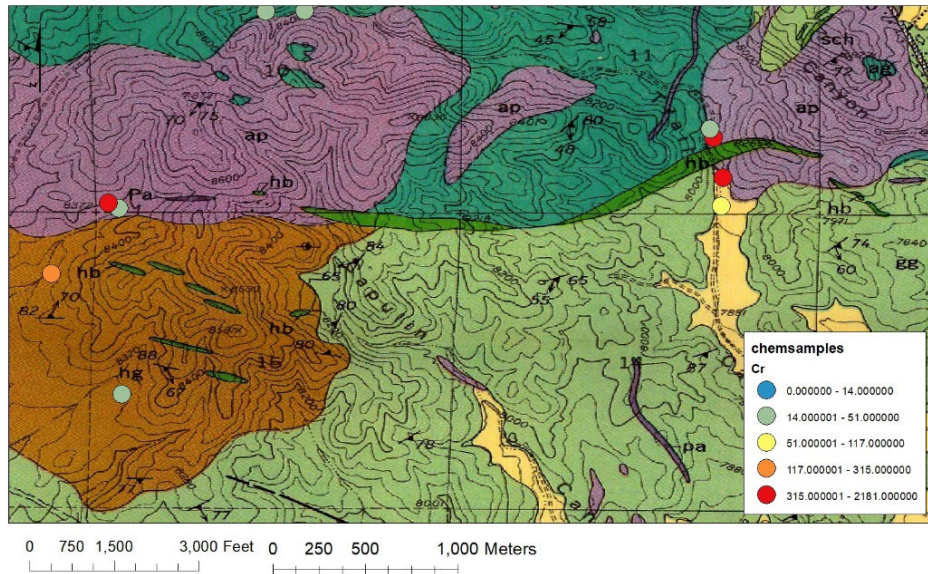


Preliminary Results



Cr in Area 4.

More results see Hunt et al. poster



Challenges

- Trying to get samples into USGS so they could get results by the end of the semester
- Scheduling field sampling at the beginning of the semester
- Private property, cannot always sample where we wanted
- Different groups all sampled one area to determine consistency
- Weather/terrain challenges
- Potential Government Shutdown
- Chemical data arrived end of semester
- Rain
 - Wet sediment (couldn't sieve in the field)
 - Dry and sieve back at the bureau
 - Unsafe roads, one site delayed for a later day



Preliminary Conclusions

- Stream sediment survey indicates areas of potential REE and Co-Cr-Ni deposits (possible PGM????)
- Other anomalies need additional examination (Cu, Ag)
- Excellent project to train future exploration geologists and geochemists
 - Funding for chemical analyses and travel required
 - More field preparation could be performed in the summer months



Copper mill foundations



Questions?

