

Field Trip to Death Valley, California

GEO4300 / 5193 Advanced Field Mapping

February 2026



uOttawa



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DEVELOPERS
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OF CANADA

Field Trip Summary

From February 11 to 21, 2026 the University of Ottawa held its Eastern California Basin & Range course which focuses on bedrock mapping near Death Valley National Park.

The course was led by Dr. David Schneider, who has taught this course at uOttawa for many years, and Dr. Renelle Dubosq from the University of British Columbia-Okanagan (UBCO). The teaching assistant was Matthew Lombardi, graduate student at uOttawa, who also took the course during his BSc program at uOttawa. Seventeen students participated in total: eleven third- and fourth-year students and six graduate students, including one from UBCO.

The group stayed at the Shoshone Education and Research (SHEAR) Center Field Station in Shoshone, California. The SHEAR Center has hosted many diverse groups of students over the years who visit Death Valley for its remarkable geology and ecology.

The course consisted of two bedrock mapping exercises: i) A folded Miocene volcanic terrane that formed as a result of crustal extension, and ii) a faulted and tilted Neoproterozoic – Cambrian succession. During the latter exercise students had the opportunity to examine rocks that represent the classic ‘Snowball Earth’ sequence, including c. 750-700 Ma diamictites and cap carbonates. Kilometer-scale mafic dikes that intruded the carbonates created talc deposits, which are still mined today. The course also highlighted the economic geology of the Tecopa Mining District of eastern California. Students mapped Cenozoic tectonic structures and magmatic rocks that host mineralization of the area, including argentiferous galena, native Au and Cu, along with their sulphide phases (pyrite, chalcopyrite).

In addition to seeing and appreciating the geological processes that students learn about in the classroom, students further developed their field skills in a new environment. The unique desert environment exposed students to a different working environment than most had experienced in past courses. Students also got to enjoy the diverse geology and beautiful sights of the area from salt flats to hot springs.

Day 0 – February 11th

An early morning for most students catching flights from Ottawa to Las Vegas. The whole group met up by midday at the Las Vegas airport and drove to Shoshone, California. Once students had some time to settle in, a quick visualisation and drawing exercise was performed to get them ready for field observations.

Day 1 – February 12th: Mapping volcanic terrain

Our first day in the field started with Professor Schneider walking the group through a volcanic eruptive sequence. A sequence was comprised of four layers: tuff, lower vitrophyre, rhyolite and upper vitrophyre. Students got to observe the flow banding of the rhyolite and devitrification structures of the vitrophyre.

Students were placed in groups of three and worked as teams to complete their ~3 km² maps. Groups would make their own decision on where to walk to best map the different units.



Figure 1: Professors Schneider and Dubosq discussing with students.

Day 2 – February 13th: Mapping volcanic terrain



Figure 2: Roxana, Sarah, Charlotte and Amelie walking along a gully looking for evidence of faulting.

Students continued to map with their teams, and to decide how many eruptive sequences were exposed within the homocline. Many teams focused on mapping the faults in the northern extent of their maps, which lined up the gullies.

Day 3 – February 14th: Mapping volcanic terrain

Our last day in this area was a shorter day in the field. Students confirmed and mapped any remaining areas. Once back from the field, students spend the afternoon and evening finishing their maps and creating a block diagram of an eruptive volcanic sequence.

After dinner, students took a short break from working on their maps and took advantage of the desert dark sky preserve to go stargazing.

Students came back and finalized their maps and their block diagrams.



Figure 3: Students working on their maps at the SHEAR Center.

Day 4 – February 15th: Geotourism in Death Valley National Park

One map done and before starting the next one, students got to enjoy the sights of Death Valley National Park!

The day started out at Dante's View, at 1669 m *above* sea level. Looking down, we can see Badwater Basin, at 86 m *below* sea level! Across the valley, Telescope Peak (3366 m) is visible which is the greatest vertical relief over horizontal distance in North America.

Next stop was the colourful badlands of Zabriskie point.



Figure 4: The whole group at Zabriskie Point.

On the way to Furnace Creek, we had a quick pit stop at the Sea Level sign.



Figure 5: All the students at Sea Level.

Our stop after the park museum and lunch was the Mesquite Flat Sand Dunes. The formation of the dunes requires three variables: sand that is eroded from the surrounding mountains, wind that gets funneled through the mountains and barriers or anchors to keep the sand in place. Students got to enjoy walking around the dunes.

The next stop was Artists Palette, which is along one of the low-angle normal faults within the valley. The combination of the fault with volcanic activity that generated the circulation of fluids created the amazing colours in the foothills.

The last stop of the day was the lowest one: Badwater Basin. Due to significant rainfall over the last few months, students got to experience the return of Lake Manly in the basin and the beginning of a super bloom. The basin is covered by salt deposits, which students had the opportunity to walk through.



Figure 6: Dante's Peak (left), Artists Palette (middle) and students walking on the salt flats of Badwater Basin (right).

Day 5 – February 16th: Neoproterozoic – Cambrian Succession

The first day in our second field area was spent together, walking the stratigraphy of the area with the instructors - ten formations in one day, from the Mojave crystalline basement, to Snowball Earth diamictites and cap carbonates, mafic dikes and alluvial deposits.



Figure 7: Students walking to their first outcrop of the day (left). Tristan walking through some alluvial deposits (right).

Day 6 – February 17th: Neoproterozoic – Cambrian Succession

The day started out with a visit to Tecopa Mines and hosted by Ross Dykman, who graciously allowed us to work on his property.

Ross is restoring the old mines of the historic Tecopa Mining District and offers tours to the public. At the museum, Ross had many mining artifacts to show students, including rocks and old maps. Of course, the presence of his dogs was appreciated by many!



Figure 8: Ross showing students some maps at the museum.



Figure 9: The group with Ross and his dog Cleopatra.

After the tour, students split into new groups to continue mapping the area. On this day, most students focused on mapping around the Columbia, Noonday and War Eagle mines, including the complex faulted area.

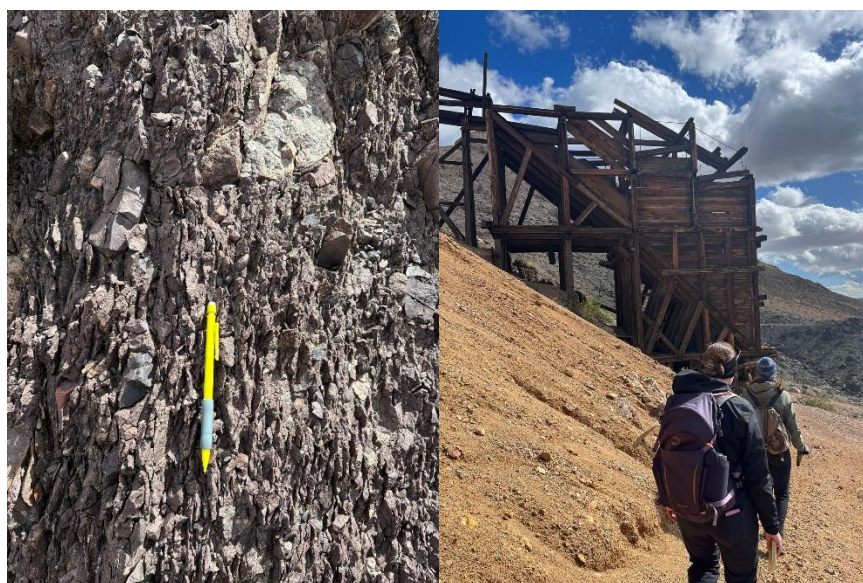


Figure 10: The Kingston Peak formation, a diamictite representing 'Snowball Earth' (left). Students walking past old mining structures of the War Eagle Mine (right).

Day 7 – February 18th: Neoproterozoic – Cambrian Succession

Mapping continued. Students mostly focused on mapping the eastern side of their maps, further focusing defining the major faults of the area.



Figure 11: Students on top of the ridge. In the distance, Matthew is helping students visualize their contacts on their maps (left). Rachel taking a strike and dip measurement while Maya is noting some observations in her field book (right).

Day 8 – February 19th: Neoproterozoic – Cambrian Succession

Our last day in the field was shortened in order to avoid the inclement weather; flash floods are a hazard in the desert. Students focused on mapping the oolitic member of the Johnny Formation. The bed stands out from rest of the formation, helpful for mapping faults since offset can easily be spotted.



Figure 12: Students taking a moment to appreciate the beautiful landscape (left). Students walking the oolite bed, which can easily be seen and identified well into the distance (right). Clouds are coming in but no rain yet!

Once back from the field, a few students took the time to visit the Shoshone Historical Museum. The museum highlights the rich history of the area including its native history and the history of women of the area. It also highlights some of the local geology, and students enjoyed seeing all

the formations they were working on mapping. The museum also has mammoth bones from the ancient Lake Tecopa.

The rest of the day was spent working on finishing our maps and making cross-section of the area.

Day 9 – February 20th: Enjoying the area



Figure 13: All students on their hike at China Ranch.

By early morning all maps were completed, and students took some time to clean up the SHEAR Center.

The group then got to the China Ranch Date Farm and did a short hike in the area near an old gypsum mine. The hike was then completed with date shakes!

Students then took a tour of the War Eagle Mine at the Tecopa Mines. Ross led the tour and continued to share his knowledge about mining "back in the day" and the effort that his team, which are volunteers, are going through to restore the mines. At it peak, lead, gold and silver were the main products mined in the region.



Figure 14: Looking down into old mining tracks coming from the lower levels of the mine (left). Azurite and malachite in the mine wall (middle). Students in the mine (right).

Students got to end the day with a visit to the Tecopa Hot Springs which are at a temperature of 103°F, due to the thinned crust and active volcanism.

Day 10 – February 21st: Travel back to Ottawa

The group left Shoshone in the early morning and made its way to Las Vegas to catch their flights back to Ottawa.

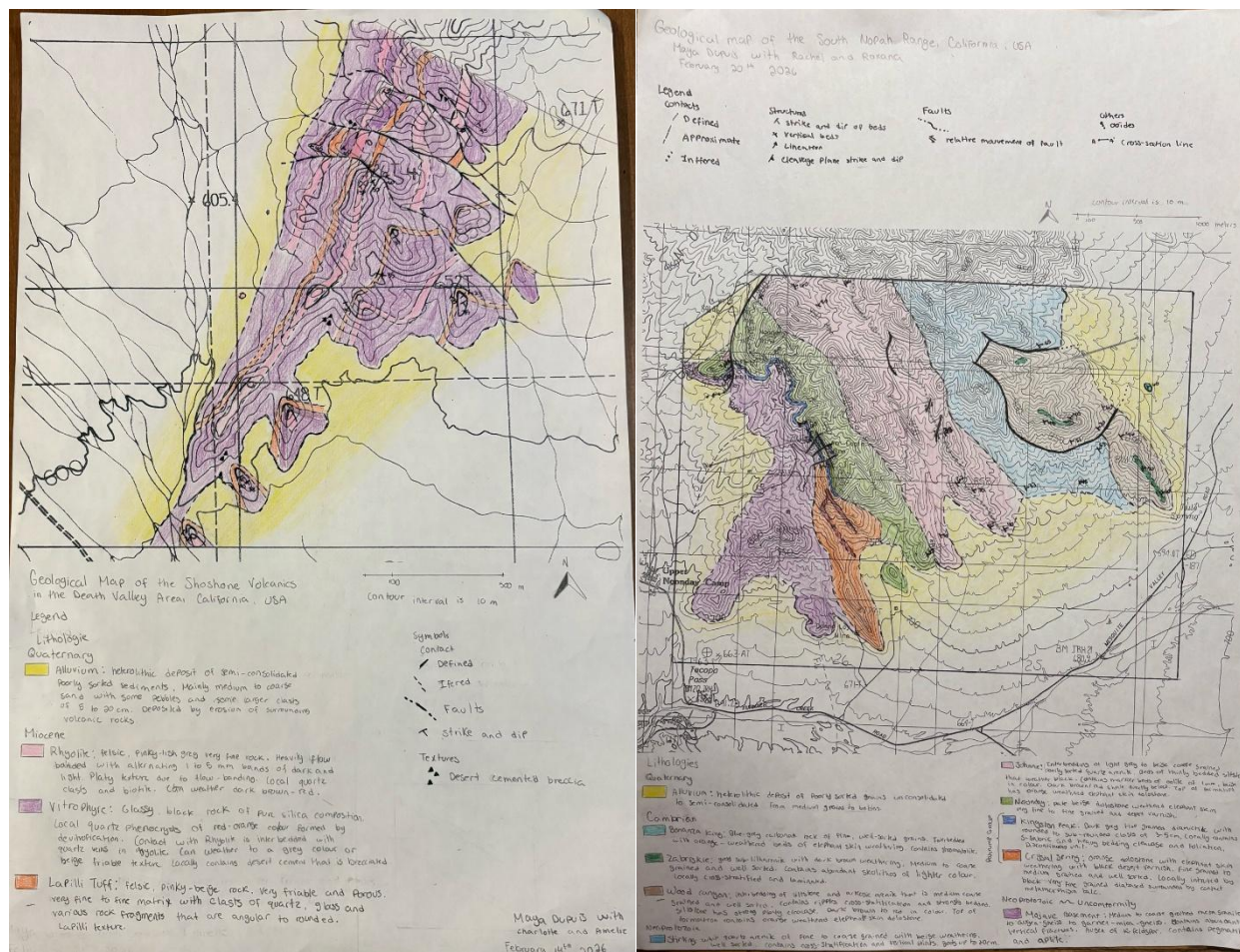


Figure 15: Map of the Shoshone Volcanics, mapping exercise 1(left). Map of the South Nopah Range, mapping exercise 2 (right).

Acknowledgments

We would like to thank the Prospectors and Developers Association of Canada (PDAC) for their generous funding contribution through the Student Field Trip Funding. Their funding allowed to keep costs low for students.

We also thank Ross Dykman from Tecopa Mines for allowing us access to his property and his enthusiasm to share his knowledge about mining in the area.

The SHEAR Center was great for housing us and providing accommodation to the many different university groups over the year. Its community-driven spirit keeps field course fees low and gives students the opportunity to study first-hand processes they learn about in the classroom.

Lastly, we would like to thank our course instructor, Professor Schneider. His efforts to give students experience in the field and pushing us to become better geologists will stay with students for many years to come. We would also like to thank to Professor Dubosq for joining us and helping run the field course smoothly as well as sharing her knowledge with students.