

Earth Science Week 2001 Field Trip #2
Fossils and Ancient Lakes
A Field Trip for Families and Rockhounds

We will make three geological stops at fossil localities and a couple of rest stops. We will be examining fossil evidence for ancient lakes in western Nevada. Our first stop will be a diatomite mine where we will see fossils of fish that lived in a lake about 7 to 8 million years ago, during the Miocene Epoch. Diatomite is composed of tiny fossils of single-celled plants that thrived in the lake. The climate in Nevada was considerably wetter at that time, in part because the Sierra Nevada had not yet risen on the west and blocked moisture from the Pacific Ocean as it does today. Diatomite is a versatile rock used as an absorbent, in acoustical tile and pipe insulation, and to filter impurities from liquids in many industrial and environmental applications. On the way to the fossil fish locality, we will pass a diatomite processing plant and a nearby diatomite mine.

At our second stop at the foot of the Mopung Hills, we will visit a site where limestone was mined about a hundred years ago for shipment to California as a soil amendment. The rock was calcined (cooked to drive off water and carbon dioxide) in a kiln that is still partially standing. The fossil-bearing limestone was deposited along the shoreline of a precursor to ancient Lake Lahontan in much the same way tufa is now being deposited around the shorelines of Pyramid Lake.

At our third stop In the Hot Springs Mountains east of Brady's Hot Springs, we will visit a "Fossil Hill" of many types of gastropods (snails) in a reef-like deposit that provokes speculation as to the climatic conditions here in Miocene time about ten million years ago.

Prehistoric natives in this area lived in caves and rock shelters along what at the time was the shoreline of ancient Lake Lahontan. The lake reached its highest levels at least four times between 75,000 and 10,000 years ago. We will see abundant evidence for this lake, such as shorelines carved by wave action and sediments deposited in the lake.

Along the Truckee River on the way to Fernley and in the mountains around Fallon we will see volcanic rocks that range in age from about 20 million years old to younger than 1 million years. Many of the older volcanic rocks are part of the same geologic phenomenon that produces volcanoes of the Cascade Mountains today. They include andesite (a kind of volcanic rock named for the volcanoes of the Andes Mountains) and rhyolite (a silica-rich volcanic rock that commonly erupts violently). White tuffs are evidence of some of the violent eruptions.

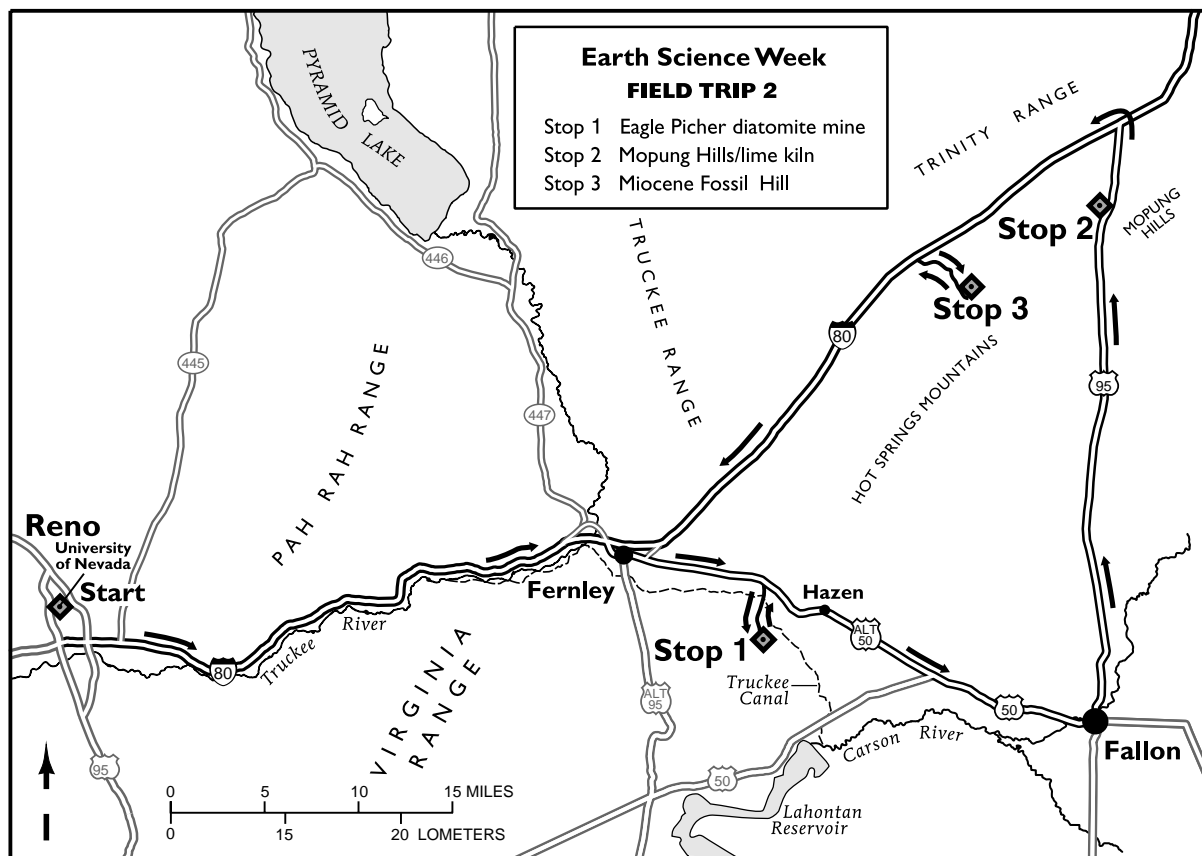
Although there are some young rhyolites in the region (particularly near Mono Lake, California, and Steamboat Springs, just south of Reno), most of the younger volcanic rocks are basalts (relatively silica-poorer rocks that tend not to erupt as violently as rhyolites). These rocks are closely related to active extension (pulling apart) of the Earth's crust in the Great Basin.

On our route, we will cross a major fault zone near Wadsworth. Nevada is the third most seismically active state in the country. Breaks in the ground from the December 16, 1954 magnitude 7.2 earthquake near Fairview Peak are easily seen at a BLM interpretative site a few miles south of U.S. Highway 50, farther east of Fallon than we will go on this trip.

We will pass a major geothermal area, Brady's Hot Springs, on our way to the last stop. Hot springs are common in Nevada, and several of these areas are tapped by geothermal power plants to produce electricity. Nevada annually produces about \$100 million worth of electricity from geothermal power plants. Geothermal energy is also used at the Gilroy Foods geothermal dehydration plant to dry onions that are used nationwide.

Many of the gold and silver deposits that have been so important to Nevada are also the result of past hydrothermal (hot water) activity that altered the rocks and deposited the gold and silver. Nevada leads the nation in gold and silver production and accounts for approximately 11% of current world production of gold. Nevada mines produce well over \$2.5 billion in gold annually.

Along the route we will see gravel pits, aggregate mines, a cement plant, and a limestone mine—all supplying the components needed to make the concrete used in buildings and roads. Aggregate currently rivals silver for annual production value in Nevada.



ROAD LOG:

cumulative miles

- 0.0 From the UNR parking lot at Evans Ave. and Record St., proceed west and then south on Evans, right on 8th St., and right on Center St. to the on ramp to Interstate 80 eastbound.
- 0.4 Turn right onto I-80 eastbound. Drive east on Interstate 80 for 33 miles to Fernley and take the Fernley East Exit (Exit 48).
- 34.3 Turn right at bottom of ramp; and go 1.1 mile on U.S. Alt-95 to the intersection with U.S. Alt-50.
- 35.4 Turn left (east) on U.S. Alt-50. Drive 7.0 miles east on U.S. Alt-50.
- 42.0 At the crest of a hill, turn right (south) onto the Farm District Road. Do not follow the paved road to the right, but bear south (left) onto a gravel road that crosses a narrow bridge over the Truckee diversion canal. Continue along the gravel road for 1.9 miles, keeping left and not taking any right turns at 0.6, 1.2, and 1.8 miles.
- 43.9 Turn right (southwest) at the truck tires in the middle of a triangular intersection. Continue 1.2 miles on the dirt road, passing under the power line, to the diatomite mine.
- 45.1 **STOP 1: Eagle-Picher Minerals, Inc. diatomite mine.** Here we will collect fossils of stickleback fish preserved in layers of diatomite, a soft, chalky deposit composed entirely of the fossilized remains of tiny algae that inhabited a lake here about 6 to 9 million years ago. *You must get permission from the owner, Eagle-Picher Minerals, Inc. (343-1818), to visit this mine.* Stay away from the high walls.

Retrace route to the highway.



Fossil fish. (*Gasterosteus doryssus* or Nevada stickleback) in diatomite (a silica-rich rock composed of skeletal remains of diatoms, single-celled plants) from a Miocene freshwater lake, about 7 to 8 million years old, Hazen Pit, Churchill County, Nevada. Fossils of the Nevada killifish or top minnow (*Fundulus nevadensis*) are also common at this locality.

- 48.1 Turn right (east) onto U.S. Alt-50 and drive 17.5 miles to Fallon. Please use rest rooms at the fast-food establishments in Fallon, because there are none at our next stop.
- 66.9 Turn left (north) at the intersection of Maine Street in downtown Fallon onto U.S. Highway 95. Continue another 27 miles north on U.S. 95 to the Mopung Hills.
- 94.2 Pull off in gravel parking area on the left (west) side of the highway opposite several large piles of highway gravel on the right.

STOP 2: Mopung Hills. Freshwater limestone was mined here about 1900. The rock was calcined in a kiln just to the west, near the railroad grade, and shipped to California, primarily for agricultural use. The ruins of the old lime kiln are still standing (looks like a chimney). The limestone was deposited as tufa along the shore of an ancient precursor to Lake Lahontan that existed here more than a million years ago. It contains fossils of several species of mollusks. Look closely at the rocks on the ground for fossils. There is also a conglomerate of stream-rounded pebbles cemented by calcium carbonate.

Eroded shorelines of Pleistocene Lake Lahontan are visible as horizontal benches on the hillsides in the Hot Springs Mountains to the west.

Follow U.S. Highway 95 north for another 4.5 miles to intersection with Interstate 80.

- 98.8 Turn left before the Interstate into the rest area for a rest stop and to read the interpretive signs about prehistoric inhabitants and early pioneers.
Exit the rest area, turn left, and go under the freeway to the entrance ramp to Interstate 80 WESTBOUND.
- 99.2 Turn left on Interstate 80, westbound. Continue southwest for about 18 miles to the Nightingale Hot Springs Exit (Exit 65).
- 117.0 Turn left at the bottom of the exit ramp and go under the freeway.
- 117.2 Turn left onto frontage road in front of the Gilroy Foods geothermal plant at the site of historic Brady's Hot Springs. Geothermal heat is used here to dehydrate onions for use in many food products.
- 117.8 Pass Brady Power Partners Geothermal Power Plant on the right. More than 15 megawatts of electricity is produced from this plant combined with the Desert Peak Geothermal plant located about 15 miles to the southeast. The horizontal pipes you see everywhere are for cooling the geothermal fluid before it is reinjected into the ground to replenish the groundwater.
- 121.0 Pass Moltan diatomite mine and plant where diatomite is mined and processed mainly for industrial absorbent. Moltan also mines and processes montmorillonite clay and zeolites used to make cat litter. Continue northeast along the frontage road.
- 122.2 Paved road ends; turn right on gravel road. The next 4.5 miles will be rough, dusty and rocky. Just back off from the cars you are following, drive slowly to save your tires, and be patient! (You will not lose us—just follow the dust trail!)
- 124.3 Take right fork in gravel road at top of a small rise, turning away from the freeway.
- 126.4 Turn left on faint dirt track to prominent hill to the east.
- 126.5 **STOP 3: Fossil Hill.**

You can see the layers of light-colored fossiliferous limestone on the hillside, dipping to the left (north) and overlain by darker colored basaltic volcanic rocks. Walk up the hill and around it to the right following the layers. See how many different fossil shells you can find and match to the photos provided. You may find that the number of different species of gastropods changes laterally along layers or from layer to layer. This may indicate change in water depth with time or from place to place.

The formal trip ends at Fossil Hill. Return to U.S. Interstate 80 and take it westbound back to Reno.

We hope you enjoyed the trip. If you have any questions about the geology, natural hazards, or mineral, energy, or other natural resources of Nevada, please feel free to contact the Nevada Bureau of Mines and Geology by telephone (784-6691), by e-mail (info@nbgm.unr.edu), on the Web (www.nbgm.unr.edu), or visit the offices on the UNR campus between 7:30 a.m. and 2:30 p.m., Monday through Friday.

Thank you for helping us celebrate Earth Science Week, which has been officially designated as the second full week of October by the Nevada Governor, the U.S. Congress, and the Association of American State Geologists to recognize the importance of geology and other Earth sciences to society. This field trip is sponsored by volunteers from the Nevada Bureau of Mines and Geology, Department of Geological Sciences, and W.M. Keck Museum at the Mackay School of Mines, University of Nevada, Reno; Desert Research Institute; Nevada Division of Minerals; Geological Society of Nevada; American Institute of Professional Geologists; Association of Engineering Geologists; Nevada Petroleum Society; Society for Mining, Metallurgy, and Exploration; U.S. Geological Survey; U.S. Bureau of Land Management; Eagle-Picher Minerals, Inc.; and Nevada Mining Association.

Prepared by D.D. LaPointe and Jon Price, Nevada Bureau of Mines and Geology.