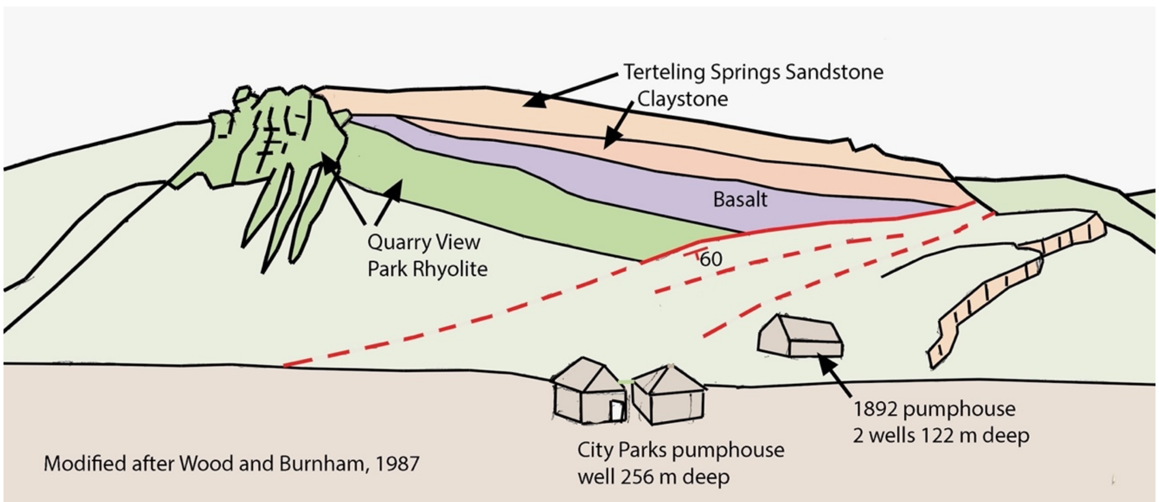
Idaho Museum of Mining and Geology
SNAKE RIVER PLAIN
Field Trip Guide

Terry Maley, August 2026

Theme of field trip: Learn the geology of the Snake River Plain by investigating rocks and geologic features typically found throughout the Snake River Plain.

Site 1. From Warm Springs Avenue, take Old Penitentiary Road to parking lot for Table Rock trails, Old Pen and Geology Museums.



Quarry View Park Rhyolite

The Quarry View Park Rhyolite is exposed on the southwest side of Castle Ridge and above Eagle Rock Park (formerly Quarry View Park).

Drilling through the rhyolite exposed at this site intersected fragmented rhyolite at the base of the flow; this feature indicates it is a rhyolite dome or lava flow rather than an ash flow tuff. Clemmons and Wood say "the Quarry View Park Rhyolite overlies the Cottonwood Creek Rhyolite." though age dates indicate the Quarry View Park rhyolite is 11.8-million-years old and Cottonwood Creek rhyolite is 11.3-million-years old. Nevertheless, this rhyolite is at least 11-milion-years old which fits right in with the age of rhyolite rocks found both north and south of the western Snake River Plain. These deposits were all erupted when the Yellowstone hotspot was in the vicinity some 11-million-years ago and now represent part of the track of the Yellowstone hotspot.

The rhyolite is at least 300-feet thick and is downfaulted 2,000 feet below the statehouse. This rhyolite is cut by prominent vitrophyre (volcanic glass) dikes, which are exposed at the large outcrop of rhyolite at this site.

The rhyolite is overlain by a 9-million-year-old basalt flow of the Boise Basalt Assemblage. This is the same basalt that we will see at sites 4 and 5 during the field trip. And the basalt is overlain by the Terteling Springs sandstone (Lake Idaho sandstone), which caps the ridge.

Rhyolites occur on both sides of the Snake River Plain but not in the central part of the plain. The age dates of rhyolites are close to the beginning of Lake Idaho

Geothermal Resources Caused by Hotspot

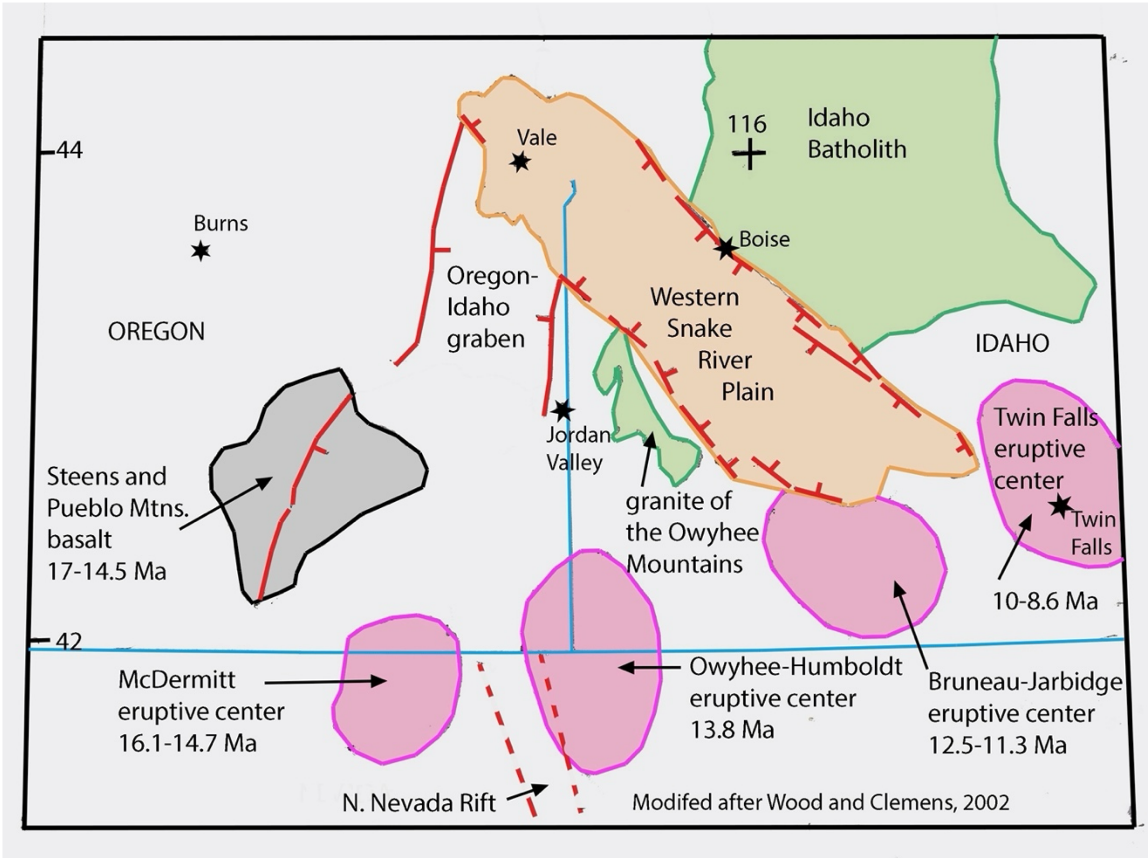
The geothermal aquifer located at this site is primarily in fractured rhyolite and confined by basaltic tuffs. The fault that fractured the rhyolite has a northwest-southeast trend and is parallel to the Boise Front fault system. Hot water is common along the northern margin of the plain due to fracturing of the faults.

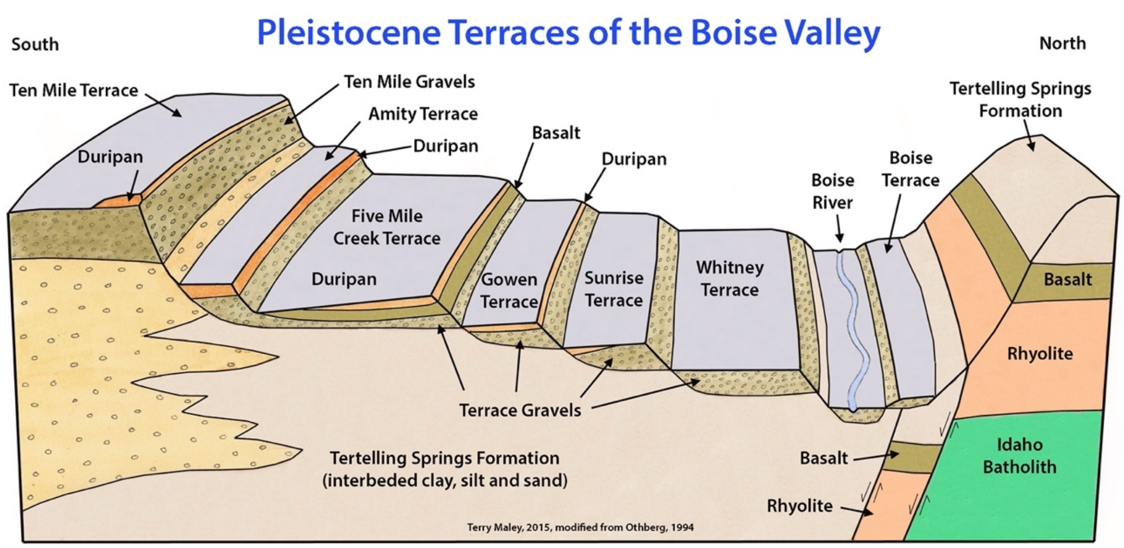
This geothermal system represents the oldest geothermal heating district in the United States. Two wells were drilled in 1890. The first well reached 394 feet and the second reached 404 feet; they are artesian and 170 degrees F.

The hot water is piped to a Natatorium and homes and businesses along Warm Springs Avenue. The present wells were constructed in the early 1900s at the site of the original wells.

The wells have a 9-inch-diameter hole and are 400 feet deep. And, they have experienced no change in temperature or pressure in 100 plus years. Since 1892, the wells have averaged 700,000 gal/day. 250 homes are still on the system.

Site 2 – Located on N. Alto Via Ct. near the intersection with E. Table Rock Road. From this site you can see a large portion of the WSRP, the Owyhee Mountains across the Snake River Plain, the Boise valley, the Pleistocene terraces and the landslides of Table rock.





Origin of Western Plain

Western plain is a huge down-faulted basin or graben. The faulting started about 11 million years ago so the western plain has existed as a basin for at least that long. The total displacement by the faults that bound the basin is almost 2 miles.

Camp and Wolff proposed a new hypothesis in 2025 that explained how the Yellowstone hotspot played a major role in the development of the WSRP. They attributed two mafic intrusions underlying the WSRP to the Yellowstone hotspot: (1) a mafic underplating 5 miles thick and 70 miles across at the Moho, and (2) an axial zone of mafic intrusion 7-miles wide and extending the length of the WSRP and located in the mid-to-upper crust. These two mafic intrusions, which are probably basalt, propagated north-northwest through a system of sills and dikes to the Chief Joseph dike swarm where they were erupted as Columbia River Basalt flows.

Camp and Wolff also proposed that subsidence, particularly in the northern portion of the WSRP was caused by withdrawal of the Columbia River Basalt from its storage area below the future WSRP. Also, some of the subsidence of the basin may have from isostatic adjustment caused by the combined weight of one mile of basalt and one mile of lake-bed sediments. Basin and Range extension may have contributed to the basin development.

On a reasonably clear day, you should be able to see the Owyhee Mountains across the western Snake River Plain. These mountains consist primarily of rhyolitic ash flow tuffs generated from huge caldera eruptions along the track of the Yellowstone Hotspot.

Lake Idaho Group

Lake Idaho existed between about 10—2.5 Ma and left a basin filled with about 1 mile of sediments. Table Rock and much of the surrounding landscape are composed of the Terteling Springs Formation—one of the formations of the Lake Idaho group. These sediments left by Lake Idaho are mostly shoreline deposits, beach, deltaic and fluvial environments formed along lake margin and are mostly derived from the Idaho batholith.

Lake Idaho overtopped a spill point near Dead Indian Ridge at an elevation of 3,600 feet about 2.0 Ma. This connected the Snake River to the Columbia-Salmon River system.

The layer of massive sandstone capping Table Rock is cemented with silica, which makes it ideal for building stone. The sandstone was first mined in 1864 when it was used to construct buildings at Fort Boise. Inmates of the prison were first used to mine the stone in the 1870s.

Table Rock

Table Rock, a prominent land mark in Boise, has a flat top which has been preserved by geothermal silica-rich fluids filling pores of the sandstone. A 50-foot-thick massive sandstone layer near the top of Table Rock has been quarried for more than 100 years. With its silica cement, the sandstone is also ideal for stonecutting.

Pleistocene Terraces

The Pleistocene terraces of Boise include 8 successive terraces caused by either climate change or lowering of base level. From Table Rock Road, you can see 5 or 6 of the 8 terraces. The terraces are overlain by 50 to 100 feet of river gravel deposited by the Boise River.

The Boise River valley has cut down about 500 feet during 2-million-year period that the terraces were carved. The terraces, commonly referred to as benches, have long been used for building sites in the City of Boise.

North Alto Via landslide

In the spring of 2016 this Classic slump formed at a preexisting landslide. Six upper-scale homes were positioned either near or along the headwall scarp of the slump. Subsequent grading of the site has obscured most of the features of the slump.

The home owners sued Ada County, Boise City, the developer and the engineering company. In 1993 Spencer Wood, professor of geology at Boise State University, published a paper that warned developers not to build on the steep slopes of Table Rock where the site is underlain by basaltic tuff.

Landslides exist on three sides of table rock, including the massive Warm Springs Mesa slide and the Warm Springs Slump slide on the south side. The basaltic tuff, steep slopes, cut-and-fill site development and irrigation water all contribute to the stability problem.

Site 3 – Located on Eastdale Drive near the intersection of East Varco Via Ct.

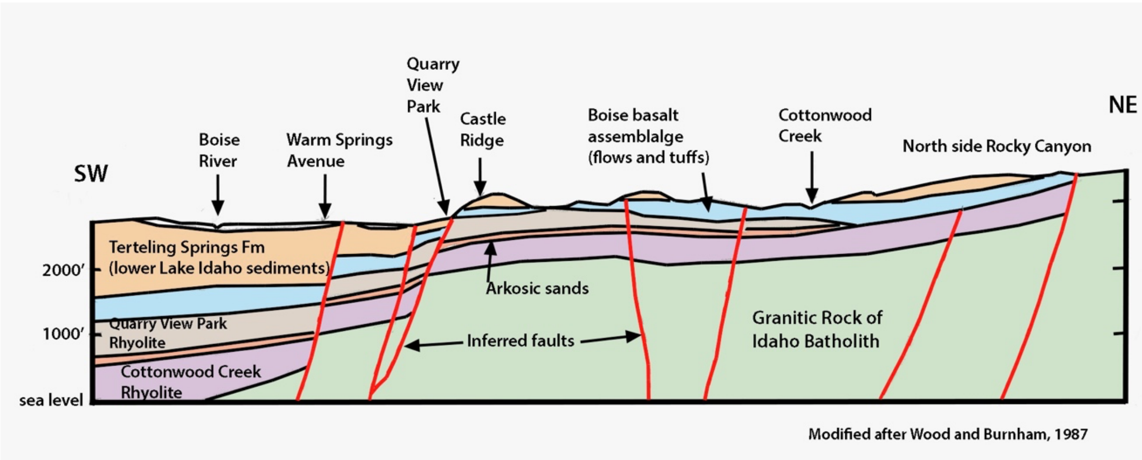
Boise Basalt Volcanic Assemblage

At this interesting site, the Terteling Springs formation overlies two successive basalt flows. The basalt flows are part of the 9-million-year-old Boise Basalt Assemblage likely deposited on the bottom of Lake Idaho.

When the second basalt flow erupted into Lake Idaho, it baked a portion of the underlying flow to a red color. The basalt at this site may be referred to as “water affected basalt” which shows significant weathering and disintegration from originating under water. The youngest basalt flow has experienced extensive spheroidal weathering.

The older or underlying flow is a coarsely porphyritic basalt with large tabular plagioclase crystals (phenocrysts) and amygdaloidal vesicles filled with zeolites, clay, calcite and chalcedony. These basalt flows are typically overlain by basaltic tuff.

Site 4 – Drive up Shaw Mountain Road to the Shaw Mountain Road parking lot at end of pavement. The two localities we will examine are located along Cottonwood Creek/Shaw Mountain Rd/Rocky Canyon.



As you drive up Shaw Mountain Road towards Shaw Mountain road parking lot, several hundred yards before reaching the parking area at the end of the paved road, you can see light gray- to light tan-colored basaltic tuff overlying rhyolite in the roadcut. The rhyolite is mostly volcanic glass and can be classified as vitrophyre. The vitrophyre has vertical flow banding and small folds.

After parking your car in the large parking area at the end of the payment, walk north or upstream through Rocky Canyon. Rocky Canyon is very narrow with a V-shaped profile because the rhyolite that is exposed on both of the canyon walls is much more durable than the Lake Idaho sandstone to the south or the granitic rock of the Idaho Batholith north of the rhyolite. You will walk approximately one-half mile from the parking lot northward to the large Boise Front Fault. As you walk through the rhyolite, observe the large air cavities, the layering and folds in the rhyolite and break open a piece of rhyolite to see the difference in color between fresh and weathered rhyolite.

The fault crosses the road and trends northwest-southeast. The fault zone is about 50 feet wide and is notable for reddish coloration of the rock and soil. The source of the red color is likely an iron oxide called hematite—a common mineral associated with faults. Immediately north of the fault is granitic rock of the 70 to 80-million-year-old Idaho Batholith which is faulted into contact with the 11-million-year-old rhyolite.

Cottonwood Creek Rhyolite

The Cottonwood Creek Rhyolite has been interpreted as a lava flow based on vertical and contorted flow banding, a basal crumble breccia and remnant pyroclastic textures. The flow is close to 400 feet thick and has numerous huge air cavities.

There are also a few outcrops of vitrophyre (volcanic glass - looks like obsidian), pumice and gray perlite. An identical rhyolite occurs at more than 3,000-feet-deep in cores taken near the Statehouse.

Granite

After crossing the Boise Front Fault, you will reach granitic rock of the Idaho batholith, which is approximately 70 to 80-million-years old. If you have a rock hammer, break open a piece of the granite to compare the appearance of the fresh surface with the weathered surface. Also, see if you can identify such minerals as quartz, mica, muscovite, hornblende, orthoclase feldspar and plagioclase feldspar. This granite is referred to as “two-mica granite” because it contains both muscovite and biotite. It was formed by crustal melting rather than arc magmatism as was the far western portion of the batholith.

Boise-Front Faults

Faulting started 11-million-years ago in the western Snake River Plain. There are hundreds of these northwest-southeast-trending faults of varying widths, lengths and offsets within the Boise Front fault zone. This fault zone in the Boise foothills is about 2 miles wide and has a total offset of almost 2 miles. The western plain is a Basin and Range structure.