# Gigantic Rhyolite Lava Flows in Owyhee County's Bruneau and Jarbidge Canyons

Imagine an enormous, pancake-shaped blob of molten lava, hundreds of feet thick, oozing outward slowly in all directions and rolling over everything until it has buried an area the size of that between Boise and Nampa. Sound like science fiction? Or your worst nightmare? Actually, this volcanic scene played again and again in the Snake River Plain during the last few million years when gigantic rhyolite lava flows erupted from the Earth and spread across the land. Nowhere is the evidence for such events more vividly displayed than in the spectacular canyons of the Bruneau and Jarbidge rivers in Owyhee County. All that is needed to appreciate the immense scale of these natural events is to see in the canyons the high, sheer cliffs of red-brown rhyolite.

Lava is molten rock, or magma, that has erupted onto the Earth's surface where it flows like hot molasses, or slowly like cold road tar, depending on its viscosity. The hotter it is the less viscous, or more fluid, it will be. Rhyolite is a volcanic rock that has the same composition as granite, a common igneous rock. Unlike granite, which is coarse grained because it crystallized over hundreds or thousands of years many miles below the Earth's surface, rhyolite is fine grained because the molten magma erupted and flowed onto the surface where it cooled and crystallized relatively quickly in a matter of days to a few years.

Because magmas within the Earth have a wide range of compositions, there are many types of lava flows. Throughout the Snake River Plain are lava flows of both rhyolitic and basaltic composition. Rhyolitic magma is relatively rich in silicon, oxygen, and other light-weight elements, and it typically forms when portions of the Earth's crust are melted. Basaltic magma is richer in iron and other heavy elements, and it is melted from the deeper and hotter portion of the Earth known as the mantle. Consequently, rhyolitic lava is less dense and much more viscous than basaltic lava, melting at 1700°-1900°F compared with 2100°-2200°F for basalt.

Viscosity mainly causes the striking differences in appearance between basalt and rhyolite. Basaltic lavas can flow as rapidly as several miles an hour and may travel more than 25 miles from their source vents. Individual basalt flows typically are only 10 to 30 feet thick. Several flows from a single eruption are commonly stacked on one another to give canyon walls a tiered appearance. Rhyolite lava flows in the Snake River Plain typically are more than 300 feet thick. These lavas must have moved slowly, perhaps at only a few feet a day. Because the lava was so stiff, it did not form thin flows and did not travel more than a mile or two before it had cooled enough to stop.

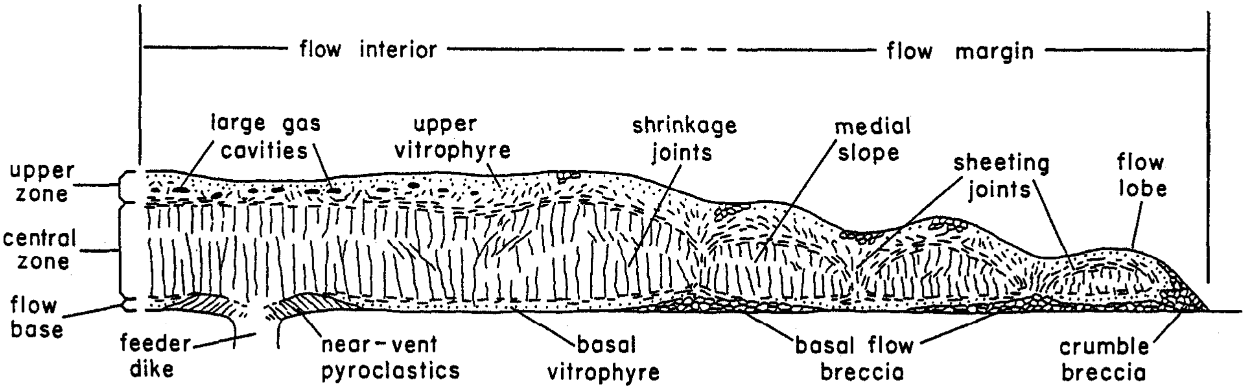
During eruption, a rhyolite lava flow resembles an expanding pancake just after being poured on the griddle. It is molten in the middle but becoming solid on the top, bottom, and margins. Prongs periodically push out here and there through the edges as magma is pumped into the flow from underneath. The last-formed prongs are preserved at the margins of the flow as irregular lobes separated by zones of volcanic rubble. Idaho's rhyolite lava flows are believed to have erupted from fissures rather than volcanoes that stand above the land. This conclusion is based on the lack of any obvious rhyolite-vent landforms in the region. Moreover, the presence in places of pyroclastic materials (volcanic ash and blown-out blocks) beneath the flows and of rhyolite dikes, which fill fissures that may have fed now-eroded flows, suggest that vents are nearby.

The moving rhyolite flows were subjected to violent steam explosions, as the hot lava encountered rain, snow, and surface water. These explosions, and the movement of the molten lava in the flow interiors, fragmented the solidified upper carapace of the flows. Accumulations of such fragmented rocks are called breccias. The fronts of the flows were also fragmented, and some of these breccias were overridden by the advancing lava blob to become basal flow breccias. Breccias that accumulate at the advancing front of a lava flow are called crumble breccias.

When rhyolite lava comes in contact with cold surface materials and freezes rapidly, it will not have enough time to crystallize. The result is a natural glass called vitrophyre. Vitrophyre is common in the marginal parts of the rhyolite lava flows. Interestingly, it typically is black or dark gray in contrast to the reds, browns, and light grays of the crystallized interior of the flows. This happens because vitrophyre is cooled too fast for the iron it contains to oxidize to the ferric state.

Three distinct vertical zones occur in the rhyolite lava flows. These are a thin, rapidly cooled basal zone, a thick central zone of massive crystalline rhyolite, and a variably complicated upper zone. The interior parts of the flows typically are 300 feet thick, or more. Because the lava was extremely stiff, the flows had to be quite thick just to move. Flow margins contain bulbous lobes of massive rhyolite lying on basal breccia layers and separated by chaotic-appearing zones of jointed or fragmented rhyolite. The flows thin toward their margins, but few are less than 200 feet thick. The marginal zones typically are up to a mile wide and grade into the flow interiors as the amount of structurally complex rhyolite between adjacent lobes diminishes.

The rhyolite in the massive central zones of the flows generally is uniform and dense. Prominent, near vertical




*Schematic cross-section from the vent area to the edge of a typical rhyolite lava flow.*

cracks, or joints, divide the flows into elongate columnar masses several feet across. These cracks are called shrinkage joints because they formed where the rhyolite fractured as it contracted during cooling. In most flows the central zones have eroded into two cliffs separated by a medial slope where late-stage shrinkage joints are more numerous and the rhyolite was easily eroded. The double cliffs arise because the shrinkage joints grew toward the flow interiors from both the upper and lower surfaces.

The basal zones of the flows are made of flow-layered vitrophyre, breccia, or a combination of the two. The zones are generally 6 to 15 feet thick but may exceed 30 feet. Most basal breccias probably formed as crumble breccias that were overridden as the lava advanced. At many places red, baked soil layers can be seen immediately below the basal zones of the rhyolite flows.

The upper zones range in thickness from 10 to 150 feet. In some places the upper zones are continuous layers of glassy-appearing rhyolite that contains abundant small gas bubbles, somewhat like in pumice, another form of rhyolite. Elsewhere, these upper zones are structurally complex because the earlier frozen material there rode on the spreading flows and was broken up and intruded by more lava from the interior of the flows. Gas cavities in the upper zones range from speck-sized holes to openings several feet across. These giant cavities mainly occur in the flow interiors. They are noted as caves on the 7.5-minute topographic maps of the Bruneau-Jarbidge area.

Sheeting joints formed during and after the final stage of flowage and while the lavas cooled and crystallized. These joints are closely spaced, subparallel fractures along which the rhyolite can be separated into flaggy sheets or platy fragments. These pieces typically are 1 or 2 inches thick and may be up to a few feet across. During erosion, rhyolite breaking along sheeting joints leads to large talus accumulations at the bases of cliffs.

The Bruneau River and its principal tributary, the Jarbidge, flow down a scenic canyon for about 65 miles in the remote eastern part of Owyhee County. This area has become one of Idaho's popular routes for wilderness float trips. Except for the last few miles, these canyons have been largely carved in rhyolite. Several gigantic rhyolite lava flows are beautifully exposed in the walls of Bruneau and Jarbidge canyons between Murphy Hot Springs on the Jarbidge and Miller Water, a small tributary to the Bruneau River.

In Jarbidge Canyon the largest and most widespread rhyolite lava flow is the Dorsey Creek flow. It is about 8.1 million years old and extends the 28 miles from Murphy Hot Springs to the Jarbidge River's confluence with the Bruneau River. The flow contains at least 18 cubic miles of lava rock and is more than 650 feet thick in the middle. Beneath the Dorsey Creek flow, the Poison Creek flow is exposed near Poison Creek, and the Long Draw flow is present where the Jarbidge joins the Bruneau.

About a mile north of the Bruneau-Jarbidge confluence, the Long Draw flow disappears beneath the prominent cliffs at the southern edge of the Bruneau Jasper rhyolite flow, near the Bruneau Jasper Mine. The Bruneau Jasper flow extends northward in the bottom of Bruneau Canyon for about 5 miles, until it disappears beneath the Sheep Creek flow.

The Sheep Creek flow is the largest rhyolite lava flow in the Bruneau-Jarbidge area. Containing at least 48 cubic miles of lava, it covers more than 300 square miles and is nearly 800 feet thick in Bruneau Canyon. It was erupted about 9.9 million years ago. The Bruneau River has sliced a sheer-walled gorge through the Sheep Creek rhyolite lava flow for a distance of about 24 miles. Its downfaulted northern limit is at Miller Water. North of this, Bruneau Canyon is carved solely in basalt.

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