Once granite reaches the surface, pressure is released, and the rock expands. As it expands, external layers delaminate. This is called **exfoliation**.

The dark veneer on the rock surface is called **desert varnish**. It is the result of a chemical interaction between bacteria and wind-borne dust particles.

#9 - Diabase

The dark rocks at this marker are part of a sizable igneous intrusion extending beyond the southern border of the Park. 1 billion years ago, the crust of the earth thinned, enabling iron-rich magma to rise and form the rock called **diabase**. The durability of Diabase has been realized throughout history. About 5,000 years ago, masons used it as the building material for Stonehenge! Here at the Park, it is the source of magnetite streaks in the washes.

#10 - Soil

Along this trail, the predominant sandy-gravelly soil is called **Grus**, derived from Oracle Granite. Grus soils are well-drained and retain heat. Most desert plants have adapted to it. At #10, there is a different soil type resulting from diabase weathering. It is a silty-clay soil that is rich in iron. Many of our desert plants find this soil less optimal, hence the scarcity of flora.

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The Geology Program is available to all ages and includes hiking trails, staff-led tours, self-guided tours, and a rock and mineral collection at the Ranch House.

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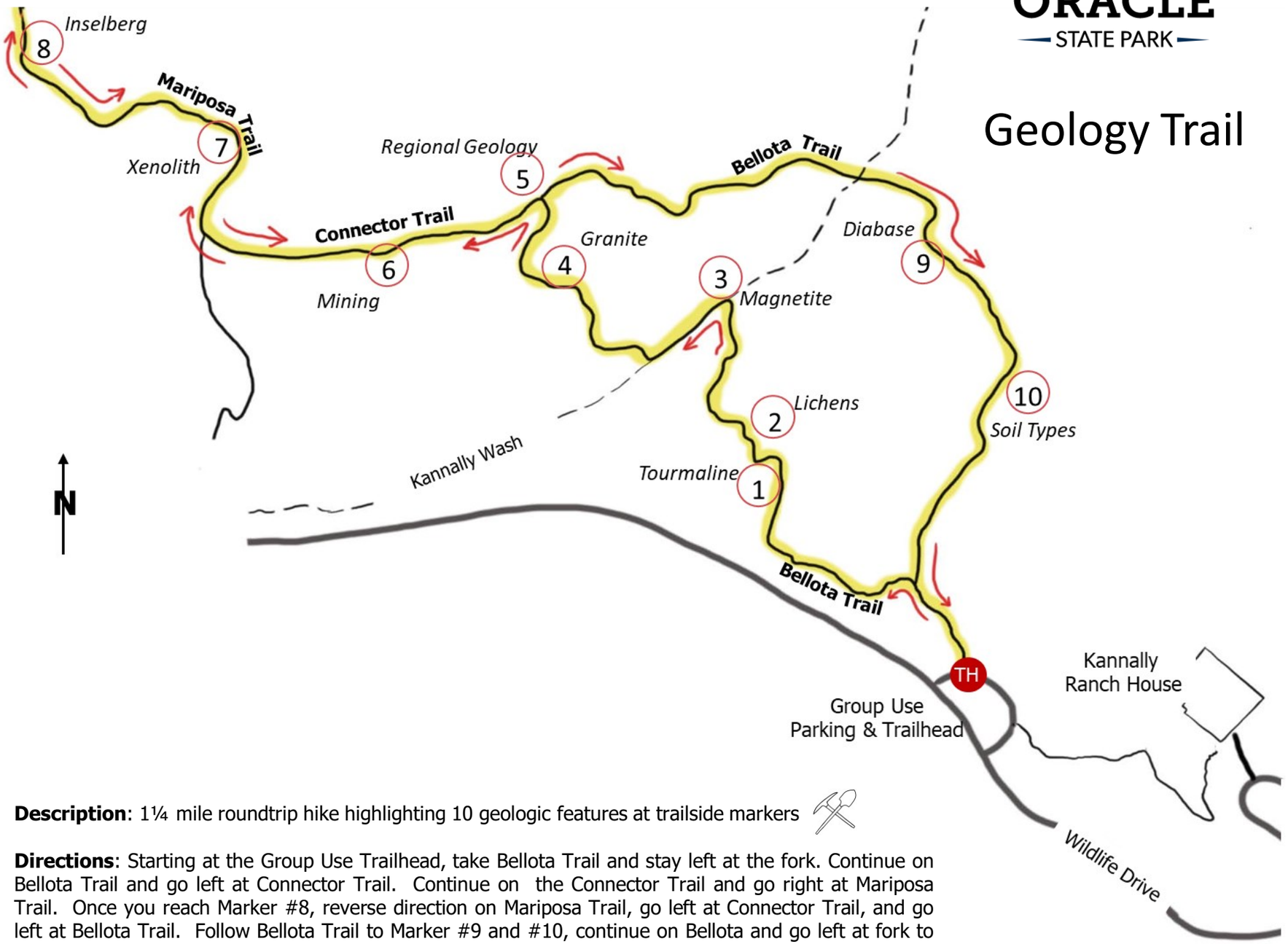
Geology Trail



Description: 1¼ mile roundtrip hike highlighting 10 geologic features at trailside markers

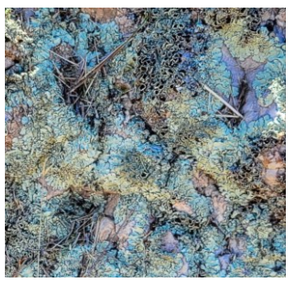
Directions: Starting at the Group Use Trailhead, take Bellota Trail and stay left at the fork. Continue on Bellota Trail and go left at Connector Trail. Continue on the Connector Trail and go right at Mariposa Trail. Once you reach Marker #8, reverse direction on Mariposa Trail, go left at Connector Trail, and go left at Bellota Trail. Follow Bellota Trail to Marker #9 and #10, continue on Bellota and go left at fork to return to the Group Use Trailhead.

The Geology Trail highlights the unique geology of Oracle State Park. Ten geology markers have been placed along the trail with the following interpretations.

#1 – Igneous Dike with Tourmaline

The bedrock at your feet is Oracle Granite. It formed from molten rock that flowed miles beneath the surface over 1.4 billion years ago. Once it solidified, residual magma flowed and broke through Oracle Granite. These break throughs are called **igneous intrusions** or **dikes**. Being more erosion-resistant than the surrounding Oracle Granite, this rock stands taller, as a small ridge near the first marker. This dike was also accompanied by flowing **hydrothermal solutions** rich in Boron. As the solutions filled rock openings and cooled, black **tourmaline** minerals crystallized.

#2 – Lichens



What looks like blue-green mosses on the rocks are not plants. They are called **lichens**. Lichens are a composite organism of two living species: fungus and algae.

They play an important role in weathering or breaking apart the rock. They loosen minerals through physical and chemical means

#3 – Magnetite Streaks in Wash

In the wash are patches of dark grains amongst the sand-sized particles. This is a magnetic mineral called **magnetite**. Storm water moves along this wash, carrying minerals like magnetite with it. Magnetite at the park is likely from two sources: Oracle Granite (#4) and Diabase (#9).

#4 – Oracle Granite Outcrop

Boulders of pink-grey speckled rock are grouped next to the trail. This **is Oracle Granite**. It is comprised of several minerals including quartz, feldspar, and biotite. Minerals have many commercial uses. **Feldspar** weathers to a clay called kaolin which is used in bricks and roof tiles. **Quartz** is crushed and used in glass making. **Biotite** is used to add sparkle to auto paints and cosmetics.

Although Oracle Granite formed miles below the surface, it is now exposed following millions of years of movement along faults and the erosion of 1000s of feet of overlying rock.

#5 - Regional Geology

The ramada at the intersection of Bellota and Connector trails, provides a panoramic view of five regional geologic features. Starting in the southwest, are the Santa Catalinas Mountains.

This mountain range is the result of millions of years of uplift of buried rock along faults. Its tallest peak, **Mount Lemmon**, is 9,157'.

Oracle State Park's south side is predominantly Oracle Granite bedrock, exposed from faulting and significant erosion. The abundant granite outcrops are examined at Marker #8.

The Park's northeast side also has Oracle Granite, but it is concealed under 100's of feet of rock and debris that has accumulated into the rounded hills, called **alluvial fans**. The fans evolved as the Catalinas eroded. The fans extend for miles, dropping 2,000' to the San Pedro Valley below.

The **San Pedro River** is an ephemeral river that flows north out of Mexico. Fossils indicate that horse, camel, mastodon, and bison lived here as recently as 11,000 years ago.

In the distant east-northeast, are the **Galiuro Mountains**, rising to 7,663' at Bassett Peak. They are also the result of block-faulting. Volcanoes were active here, producing a series of lava rock, ash, and pyroclastic flow deposits.

#6 – Volcanics, Ore Deposits

At this marker, you are standing on an igneous outcrop of **Dacite**. It is about 70 million years old. Nearby, this rock's molten source played host to hydrothermal solutions that carried valuable minerals like **copper, gold, and silver.**

These mineral-rich solutions followed faults and fractures, intruding Oracle Granite and other neighboring rocks. Millions of years later, when the rocks were closer to the surface, groundwater trickled downward into the ore deposits, enriching them further.

Just south of the Park, copper and gold were mined at numerous locations during the 1900s. A few miles north, one of the largest mines in the U.S., the San Manuel-Kalamazoo Mine, produced copper, gold, and molybdenum for more than 50 years.

#7 - Xenoliths

Xenoliths are older rocks broken off and carried by molten rock as it moved upward from beneath the surface.

A 1.7-billion-year-old xenolith called **Pinal Schist** is visible here. It formed at a continental edge. Ocean currents carried sediment to the sea floor. Over millions of years these deposits were compacted into a sedimentary rock called a **turbidite**. With additional pressure, it metamorphosed into Pinal Schist, the oldest rock of this area.

#8 - Inselberg

The Oracle Granite boulders initially formed deep in the earth as part of Oracle Granite. As they moved towards the surface, they cracked from the release of pressure. Over millions of years the cracks widened as groundwater intruded. Material filling the cracks eroded when the once buried boulders of granite were fully exposed at the surface. They are **inselbergs** or "island hills".