Metamorphically Altered Sediments

Green patches in the Klamath and Blue Mountains on this map represent sedimentary rocks that date back hundreds of millions of years. These ancient rocks were transported to North America by the conveyor belt mechanism of plate tectonics, then attached or accreted to this continent. In the process of accretion, the rocks were heated and compressed to such a degree that new mineral crystals began to form within them. Fossils entombed and still visible in these metamorphic rocks clearly show their exotic nature.

Flood Basalts

Salmon-colored patches on this map in the north-central part of the state and into the northern Willamette Valley represent lava flows dating back 10 to 17 million years. These lavas, or flood basalts, called the Columbia River Basalt Group, are a flat black finely crystalline rock that flowed easily, owing to its high-temperature source deep within the earth at the margin of the lower crust and upper mantle regions. Flowing from fissures and cracks in the crust of Idaho and Eastern Oregon, the lavas made their way to the Oregon Coast several hundred miles away, invading as far south as Salem. Today these rocks make up most of the scenic headlands along the northern Coast.

Coarse, Crystalline, Intrusive Rocks

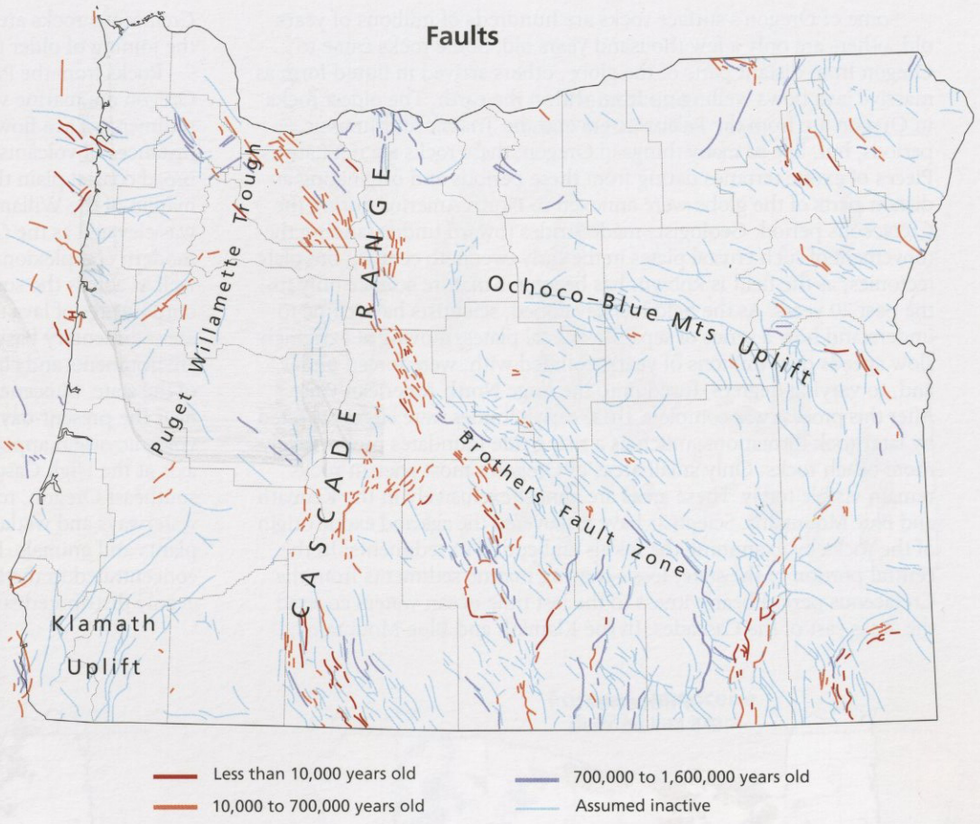
The bright pink areas of the map in the northern Coast Range, Klamath and Blue Mountains are coarsely crystalline plutonic rocks such as granites and dolerites. These rocks, which cooled very slowly far below the earth's surface, were later exposed by erosion. They represent the "glue" which joins the exotic terrane rocks to North America. Economically, these granites are important for their gold content. Similar rocks underlie much of the state beneath the Cascade Mountains, but it will be millions of years before erosion exposes them.

Non-Marine Sediments

The buff-colored patterns scattered across most of Eastern Oregon on this map represent non-marine (freshwater) lake and stream sediments dating back as much as 40 million years. These small basins were created typically when volcanic activity disrupted and blocked stream systems, causing water to pond up behind the dams of lava and ash. The rich fossil record of plants and animals preserved in the soft sediments yields a superb account of life in Oregon's distant past.

Dark-Colored Iron/Magnesium-Rich Rocks

Dark blue smaller exposures in the Klamath and Blue Mountains on this map represent volcanic and sedimentary rocks that were severely compressed and heated during the annexation to North America of these two great provinces. The alteration process of metamorphism in these rocks is so thorough that very little remains of the original parent rock, and any fossil remains have been obliterated.



Volcanics of the High Lava Plains

Shown in a light purple color on this map, volcanics in the high lava plains cover a vast tract across southeast Oregon, representing eruptions dating back 15 million years. These basaltic lavas escaped as runny fluids from the crust as the Great Basin was stretched and greatly thinned. The dry climate of Eastern Oregon preserves much of this volcanic complexion as low cones and domes.

Quartz-Rich Volcanic Rocks

Shown in light pink on the map, these quartz-rich volcanics represent both rhyolite (gray to pink fine-grained volcanics) and its glassy equivalent, obsidian. Derived from much shallower reservoirs of magma higher in the crust than the basalts, the quartz-rich volcanics tend to erupt very violently and form small domes and cinder cones. Their high quartz content makes them stand up well—much better than the basalts—against processes of erosion and decomposition.

Cascade Andesite and Basalt

Shown in bright yellow on the map in a north–south line across the western part of the state, the Cascade volcanics are still a work in progress, as many of the volcanoes in this region are still active. The Cascade Range sits astride a broad platform of shield volcanoes of dark black fine-grained basalt. The High Cascade peaks are predominantly andesite (first named in the Andes of South America). In contrast to the black, dense basalt, andesite is a less dense gray rock that forms the splendid stratovolcanoes which characterize the Cascade Mountains.

Faults

Under great pressure, rock will eventually fail, creating faults, or slip planes; these fractures impart a grain or pattern to the geology of an area. The pattern reflects differing intervals of pressure and tension over time. Individual faults have a limited life span, active for thousands to millions of years, before being bypassed by younger faults. The different colors on this map show how recently a fault has been active; the more recent the activity, the greater likelihood of an earthquake in the future (see Earthquakes, pages 138–139). Oregon contains numerous faults that generally fall into discrete zones, often forming the boundaries between more stable blocks in between. The faults along the Coast separate the soft accretionary wedge of oceanic sediments from the harder crystalline continental crust. The faults in the Cascades separate the advancing edge of the North American Plate from the more stable interior. The faults in Eastern Oregon surround stable, generally uplifted, blocks of continental crust. A well developed northwest–southeast fault trend can be found over much of the state, but it is perhaps best shown along the Brothers Fault Zone. Very ancient faults trending primarily north–south in the Blue and Klamath Mountains marks the telescoping, emplacement and annexation of these massive crustal blocks to North America more than 100 million years ago. Parallel to the Cascade crest a series of north–south faults mark the stretching of the crust that has accompanied volcanic activity here dating back 40 million years.