Chapter Introduction: Geology of Southwest Oregon

Southwest Oregon has a rich, diverse, and complex geologic history. Geologic features in the region range from the ancient Klamath-Siskiyou Mountains to the geologically young High Cascade Mountains. The flat topped mesas of the Table Rocks, with their own unique geologic history provide a look into the forces that shaped and continue to shape southwest Oregon.

The Ancient Klamath-Siskiyou Mountains
The Klamath Mountains, which include Mount Ashland, are a rugged tangle of mountains that occupy northwestern California and southwestern Oregon. The northernmost range of the Klamath Mountains, which connects to the Cascade Mountains to the east, is known as the Siskiyou Mountains. The Klamath Mountains were formed at the bottom of the ocean off the ancient "Oregon" coast. The action of plate tectonics accreted these distinct rock sequences (also known as terranes) against the stable North American plate at Oregon's margin or plate boundary. One way to look at the Klamath Mountains is as rocks that were formed off the coast. Plate tectonics caused these rocks to rise causing the State of Oregon to become bigger. The rock types of these terranes are over 200 millions years old and include volcanic and meta-sedimentary rocks, ophiolite, schist, sedimentary sand, mudstone, and shale. It is thought these terranes of the Klamath Mountains were joined to the stable North American continent in the early Cretaceous period.

Due to the complex topography, geological diversity, and location at the junction of several different ecoregions, the Klamath-Siskiyou region is renowned as one of the most biodiverse places in North America.

Sedimentary Rocks of the Hornbrook and Payne Cliffs Formations
In the Late Cretaceous period (100 to 65 million years ago), southwestern Oregon was inundated by a shallow seaway, which deposited a layer of sandstones and mudrocks known as the Hornbrook Formation. These sedimentary rocks, which contain marine fossils such as ammonites, gastropods, clams, and shark's teeth, are exposed along the flanks of the Klamath Mountains south and east of the Rogue River. During the Eocene epoch (48 to 34 million years ago), rivers and streams flowing in southwestern Oregon deposited over a thousand feet of sandstones and conglomerates, known as the Payne Cliffs Formation. The flanks of the Table Rocks consist of sedimentary rock from the Payne Cliffs Formation.

The Cascade Mountains
During the Oligocene period (34 to 24 million years ago), the area witnessed the birth of volcanoes forming a range called the **Western Cascades**. These volcanoes, no longer active, deposited thousands of feet of volcanic mudflows, volcanic ash, and lava flows. Most of the rock formations they deposited have undergone extensive erosion.

The younger **High Cascades**, which include the majestic peaks formed by stratovolcanoes such as Mt. St. Helens, Mt. Hood, Mt. McLoughlin, Mt. Lassen, Mt. Shasta, and Mt. Mazama (Crater Lake), are much younger in origin, having arisen in the last 1-2 million years. The High Cascades are still active volcanoes today.

A Collision and Erosion
Approximately 15 million years ago the Klamath Mountains uplifted as two tectonic plates (the Juan de Fuca and the North American) collided. This collision tilted the Payne Cliffs Formation and the Western Cascades rock layers to the northeast. At the same time, the Rogue River began to erode these tilted rock layers. By the late Miocene period (23 to 5 million years ago), the Rogue River had carved through much of the sedimentary rock of the Payne Cliffs formation and the volcanic rock of the Western Cascades to form a broad valley that was 600 feet higher than it is today.

The Table Rocks
The Table Rocks are two of the most prominent topographic features in the Rogue River Valley. These flat-topped mesas rise 800 feet above the north bank of the Rogue River between Sam's Valley and Central Point. Though many people assume Upper Table Rock is taller than Lower, the Table Rocks are actually named for their relative positions along the Rogue River, Upper being further upstream than Lower. Unlike the surrounding rounded hills in the valley, the Table Rocks have flat-topped summits that abruptly drop to meet the valley floor below. The elevations of both Table Rocks are just over 2,000 feet above sea level and both have a horseshoe shape.

Approximately 7 million years ago, a shield volcano near Lost Creek Lake erupted and spread andesite lava over much of the valley. The easternmost exposures of the lava flow are east of Prospect in the High Cascades, while the westernmost exposure is found on top of Castle Rock, just west of Lower Table Rock - a distance of 44 miles. The thickest remaining portion of the lava flow is 730 feet thick and is located near Lost Creek Lake, while the western edge of the flow is 150 feet thick at Castle Rock.

Over the past 7 million years, the ancestral Rogue River meandered through the valley, wearing away most of the andesite lava cap and the underlying Payne Cliffs Formation. Approximately 90 percent of the original Table Rocks lava flow has eroded away. In addition to flowing water other erosional forces have contributed to breaking down the lava flow: water freezing and thawing in the cracks of rocks, the root systems of plants loosen soil and rocks, the acid released by lichens breaks down rocks, and wind. Erosional processes continue to shape the landscape and break down the Table Rocks. It is likely someday Upper and Lower Table Rocks will no longer be the prominent features in the Rogue Valley that they are today.

The View from the Table Rocks as a Geology Teaching Tool
Looking south from the top of either Table Rock, the panoramic view offers a great opportunity to discuss the region's complex and varied geology. The most prominent landmark, Mt. McLoughlin, is part of the High Cascade Mountains and is one of the youngest landforms in the area, dating to a mere 1-2 million years. On a clear day, visible against the skyline to the right of Mt. McLoughlin, is Pilot Rock. Pilot Rock is a basalt volcanic plug; it formed from lava that hardened within the neck of an ancient volcano, which has long since eroded. Pilot Rock, a remnant of the Western Cascade Mountains, is about 30 million years old. To the right of Pilot Rock, Mt. Ashland composed of some of the most ancient rock in the region at an age of 168 million years old, rises ruggedly skyward. Past Mt. Ashland, the innumerable ridgelines of the Klamath Mountains can be

seen stretching into the distance. An illuminating contrast can be drawn between the shapes of Mt. McLoughlin and Mt. Ashland; McLoughlin has the classic steep conical shape of a stratovolcano, while Mt. Ashland is simply the highest ridgeline among a tangled maze of ranges that were uplifted from the ocean floor as tectonic plates collided. Finally, when looking to the southeast toward the source of the Rogue River, imagine the tremendous lava flow which originated near Prospect and filled much of the ancient Rogue River valley. The Table Rocks are a remnant of that 7 million year old volcanic event.

Information adapted from:

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