Unmetamorphosed Precambrian to Cretaceous sedimentary strata form most of the Eastern System. These sedimentary strata, which have been uplifted several thousand feet by fault movements, are well exposed in the Rocky Mountains. The Interior System is composed largely of metamorphic, sedimentary and volcanic rocks of Precambrian to Mesozoic ages, which are intruded by numerous, generally unconnected, granitic stocks and batholiths. In places, these rocks are overlain by great thicknesses of Cretaceous and Tertiary volcanic and sedimentary strata. Flat-lying Tertiary basalt flows form many of the plateaux. In the Western System, the rugged Coast Range consists of almost continuous exposures of steeply eroded granitic rocks of Mesozoic and Tertiary ages flanked on both sides by late Palæozoic and Mesozoic volcanic rocks and by basins of Cretaceous and Tertiary sedimentary rocks.

During late Precambrian times, beds of quartzite, argillite, dolomite and other sedimentary rocks now comprising the Purcell and Windermere beds were deposited in the eastern Cordilleran geosyncline, a vast shallow sea that extended from south of the present Canada–United States border to the Arctic Ocean. From Cambrian until mid-Devonian time, sedimentary strata consisting of shale, quartzite and limestone continued to be deposited in the area which now forms the Eastern and Interior Systems. In southeastern British Columbia, the world-famous Sullivan zinc-lead orebody lies in Purcell beds and is thought to have formed during late Precambrian time.

Beginning in the mid-Devonian and lasting until early Jurassic, the Western System and most of the Interior System consisted of a deep oceanic trough in which accumulated submarine basalts and fine argillaceous and cherty sediments such as those of the Permo-Carboniferous Cache Creek Series and the Triassic Takla Series. Meanwhile, sedimentary strata were forming in the more shallow waters of the Eastern System, east of the present Rocky Mountain Trench. Thus, in the Rocky Mountains, Palæozoic limestones, dolomite, quartzite and shale are overlain in many places by similar Mesozoic rocks.

The first large granitic bodies were intruded into rocks of the Interior and Western Systems during early Jurassic time. They were composed mainly of granodiorite and quartz diorite, but ranged in composition from gabbro to granite. These intrusions were accompanied by folding, faulting and metamorphism. Although this orogeny may have been most intense during late Jurassic to early Cretaceous time, intrusion continued until early Tertiary time. Many mines in the Cordillera are related to Mesozoic and Tertiary intrusions. Uplift of the rocks during these processes created mountain chains and, by early Cretaceous time, rhyolites, andesites, basalts and sediments were being deposited in inter-mountain basins largely separated by the uplifted areas. Erosion of the mountains followed and, in late Cretaceous time, sandstones, conglomerate, shale and extensive beds of coal accumulated in large isolated basins such as that now occupied by the Nanaimo Series on Vancouver Island. Gradual uplift continued so that by Tertiary time the basins were very local and entirely continental. Sandstones and other sediments derived from elevated areas continued to be deposited in the low-lying valleys.

Uplift and mountain-building in the Eastern System was delayed until the Laramide Orogeny in early Tertiary time. Unlike the earlier orogenies to the west, no significant granitic bodies were intruded in the Eastern System. In many parts of the Rocky Mountains, Precambrian and Palæozoic strata were thrust several miles to the east along low-angle westward-dipping fault planes. Thus, these transported older rocks commonly came to rest above younger beds. At the same time and again in late Tertiary time, the eroded Western and Interior System rocks, as well as those of the Eastern System, were again uplifted. Erosion, including glacial scouring, which in places has continued to the present day, formed deep valleys in the elevated rocks and has produced the present configuration of the Coast Range, the Rockies and the intervening mountain chains.

In the Interior System, much lava was deposited on the plateaux at various times during the Tertiary Period, mainly in or about Miocene time. The lavas are chiefly basaltic and apparently welled from long fractures rather than from individual volcanoes. Sandstone, shale and volcanic ash were deposited in local freshwater basins in the same belt.