

PROVINCE AND SECTION	SUBSECTION	UNIT AND COMPONENT							
		NAME	UNIT MAP SYMBOL	COMPONENT MAP SYMBOL	DISTRIBUTION	DESCRIPTION	LOCAL RELIEF	RANGE OF ELEVATION	GEOLOGIC CONTROLS
COLORADO PIEDMONT SECTION OF GREAT PLAINS PROVINCE — East of the Front Range of the Southern Rocky Mountains, river valleys that widen eastward separate areas of low uplands. In the Colorado Piedmont area of this map, the South Platte River and its tributaries have stripped away a cover of sedimentary rocks that once was continuous with rocks of the High Plains section of the Great Plains in easternmost Colorado. The stripping process uncovered an old surface of low hills and valleys that has now been partly covered again by stream- and wind-borne sediments. The Piedmont surface is much lower and less rugged than the Front Range surface, but generally it is more irregular than the less eroded surface of the western High Plains. Piedmont elevations in the map area range from about 4,600 feet (1,402 m) in the northeast to about 5,600 feet (1,707 m) in the southwest.	Upland subsection.	Flat-topped upland unit; slope component shown locally.	UF	S	Present as benches, mesas, and buttes in a north-south belt, 2–7 miles (3.2–11.3 km) wide, located east of the hogback subsection of the Front Range, and as mesas and buttes farther east.	Upland units (UF) that have nearly level or very gently sloping upper surfaces (generally 1–3 percent, locally steeper near the hogback subsection) may be bordered by gentle to moderately steep (as much as 25 percent) smooth to gullied slope components (S), or may be gradational to surfaces of adjacent landforms. Few or no prominent upper surface irregularities are present. Surfaces of large benches, which merge into hogbacks on the west, or of mesas, isolated from hogbacks and surrounded by border slopes, may have slightly incised drainage courses generally parallel to the predominantly eastward surface gradient. A few shallow deflation basins are filled with water for use as reservoirs or stock ponds. Locally between Boulder and Lyons, two or more adjacent bench surfaces at slightly different elevations are mapped together. Buttes are smaller in areal extent than mesas and the nearly flat upper surfaces are too small to show at 1:100,000 scale; butte tops are indicated by a + symbol. Slope components are shown where their width allows representation at 1:100,000 scale. They are hachured where much or all of the slope has an 8-percent or steeper gradient, locally as much as 15 percent.	Generally less than 10–15 feet (3.0–4.6 m) on upper surfaces; border slopes very low to about 300 feet (91 m). Isolated mesas and buttes not mapped if relief above surrounding surface is less than 50 feet (15.2 m).	4,950–5,600 feet (1,509–1,707 m); lower eastern ends of upper surfaces may approach elevations of terraces or bottomlands.	Gravel deposits as much as 15–20 feet (4.6–6.1 m) thick cap flat-topped uplands. Locally, the upper part of the gravel is clayey and calcareous and commonly has a thick, strongly developed soil profile. Bedrock shale and sandstone below the gravel may be exposed in bordering slopes or covered by colluvium or windblown silt or sand.
		Upland complex unit. (The term "complex" here indicates a great diversity of surface features.)	UCA		Separating and locally surrounding flat-topped upland areas (UF); extending as much as 9 miles (14.6 km) eastward from the hogback subsection.	Upland areas (UCA) where much or all of the once nearly continuous upland-flat surface along the east side of the hogback subsection has been destroyed by erosion. In contrast to the smooth surfaces of many upland flats, UCA areas have many irregularities, as well as commonly lower elevations than UF areas. Branching courses of intermittent streams that drain the area eastward may separate low rounded interfluvies or remnants of upland flats. Locally, narrow north- to northeast-trending sharp-crested rocky ridges, similar to the larger ridges in the hogback subsection to the west, rise 20–50 feet (6.1–15.2 m) above adjacent surfaces. Slopes in UCA areas range from very gentle to steep (approaching 45 percent) and from smooth to densely gullied. Slope components are not mapped separately in UCA because of their small scale or lack of clearly definable boundaries, but a few abrupt breaks in slope are shown by hachuring (for example, 4–5 miles (6.4–8.1 km) south of Fort Collins).	Maximum commonly less than 200 feet (61 m); about 250 feet (76 m) in a few places.	4,950–5,600 feet (1,509–1,707 m); highest in Boulder-Lyons area.	Tilted layers of shale and sandstone bedrock are exposed in slopes below weathered gravel cappings of upland bench or mesa remnants and in uncapped ridges and intervening valleys. Lower slopes within UCA commonly are covered by colluvium; alluvium occupies bottoms of some drainage courses. Wind-deposited silt and clay are extensive in eastern parts of some UCA areas.
			UCB		North and east of Cache la Poudre River and mainly west of Coalbank Creek.	Broad upland (UCB) between the Cache la Poudre Valley and the Eaton-Ault mantled lowland is highest near the north edge of the map area. Elevations decrease very gradually to the southwest, southeast, and east. The upland surface is scored by closely spaced, mostly shallow valleys that trend southeastward in much of the area. Between Timnath and Windsor Reservoirs and in other smaller areas, drainage courses trend to the southwest. Throughout the unit, long low dune ridges of silt and sand are aligned northwest-southeast with slight divergence from the southeastward drainage. Deflation basins are abundant and many are used as lakes or reservoirs. Natural landform features have been much modified by intensive cultivation and by construction of irrigation systems.	As above.	4,670–5,270 feet (1,423–1,606 m).	UCB and UCC — Bedrock (shale and sandstone) is more nearly flat lying than in UCA areas; UCB, however, is developed on a broad, very low anticlinal structure. Wind-deposited sand and silt conceal much but not all of the bedrock surface and in some places have formed elongate dunes. Weathered gravels cap a few of the highest hills and are present locally at lower levels as discontinuous remnants of largely eroded terraces near the southwest edge of UCB north of Windsor and in the UCC area northwest of Greeley.
			UCC		Area extending about 6 miles (9.7 km) west of Greeley.	The degree of surface irregularity in this area (UCC) is intermediate between the diversity of many UCA areas or UCB, and the much less complex rolling upland (URA) into which the UCC area grades on the west. Slopes of approximately 3 percent or less are dominant in UCC but their uniformity is broken by areas of 5–7 percent slope. Shallow valleys tend to drain toward the nearest low border of the unit, in contrast to the dominant southeastward drainage in much of the UCB unit.	As above.	4,660–5,020 feet (1,420–1,530 m).	
		Rolling upland unit; slope component shown locally.	URA	S	West of South Platte River (except as noted under URB) and south of Cache la Poudre River.	Broad areas (URA) of nearly flat to very gently rounded surfaces (slopes generally less than 5 percent) between major stream valleys. Low hills are aligned along some divides between drainage courses; other divides have little surface irregularity. Upper reaches of drainage courses lie in shallow depressions not shown on map. Along lower reaches, slope components (S) of rolling upland are mapped where a break in slope between valley side and main upland surface is recognizable on topographic maps or air photos. Similar slope components are shown between the upland surface and adjoining terrace or bottomland units. Slope components range from smooth to densely gullied and in places (hachured at top of slope) are steeper than 8 percent. URA surfaces contain wind-scoured depressions.	Very low to about 200 feet (61 m); highest in south part of area.	About 4,700 feet (1,433 m) in the northeast to 5,300 feet (1,615 m) in the southwest part of the area.	URA and URB — Areas underlain by shale and sandstone bedrock, in part coal-bearing; bedrock generally nearly flat lying, locally faulted and folded; nearly everywhere blanketed by windblown material (clayey silt to sand). Bedrock at or close to surface along some incised drainage courses, in some border slopes of unit, and very locally on hillsides below small remnants of gravel cap. Some marginal slopes partly covered by colluvium. Wind-deposited sediment east of the major streams is generally younger and more sandy and has less well developed soil (URB) than wind-deposited material to the west (URA).
			URB	S	East of South Platte River and, to the west, between the South Platte and parts of St. Vrain and Boulder Creeks.	URB units are similar to URA, but have a greater number of small irregularities caused by wind action. A higher sand content in the blanket of windblown sediment leads to widespread formation of dunes and deflation features; sand hills, which are clusters of dunes partly anchored by grass, are present on the rolling-upland margins of Beebe Draw near the east edge of the map area.	As above.	As above.	
	Lowland subsection.	Terrace unit; slope component shown locally.	TE	S	Borders bottomland along major and some secondary rivers and creeks; discontinuous in many places.	Nearly level to very gently sloping surface (TE), locally dissected by small intermittent streams; may border one or both sides of a stream valley, continuously or intermittently. The terrace surface commonly is less than 5 feet (1.5 m) to less than 25 feet (7.6 m) above the nearest bottomland surface and is separated from the bottomland by a gently to moderately steeply sloping terrace front (slope component, S), which in many places is too narrow to map at a 1:100,000 scale. The mapped terrace unit may contain two or more terraces at successively higher levels away from the bottomland. Transition from terrace to higher upland may be abrupt or gradational and may be masked by windblown silt and sand.	Less than 10 feet (3.1 m) to less than 50 feet (15.2 m).	About 4,600 feet (1,402 m) in the northeast to 5,500 feet (1,676 m) in the southwest part of the map area.	Alluvial deposits, generally coarser, in part, toward the mountain front. Locally covered with wind-deposited silt or sand, in dune form in some places.
		Bottomland unit.	B		Along major and some secondary rivers and creeks.	Nearly level to very gently sloping surface (B), lower than terrace units; includes present stream channel, adjacent areas that are subject to 100-year flood inundation (McCain and Hotchkiss, 1975), and extensions of the flood-prone surface to the first bordering break in slope (edge of mapped terrace or upland unit). Surface irregularities within bottomland unit include low terracing in the flood-prone area, incised present stream channels, and segments of abandoned channels. Small lakes are present in abandoned-channel segments and in old gravel pits. Unit is very narrow to as much as 2 miles (3.2 km) wide. Locally, the bottomland unit extends across the hogback subsection and in places is continuous with the valley-floor unit of the lower mountain subsection.	In most places less than 10 feet (3.1 m) to less than 40 feet (12.2 m).	About 4,600 feet (1,402 m) at downstream limit of South Platte River in map area; above 5,500 feet (1,676 m) in southwest part of map area.	Alluvium; some windblown sediment.
		Mantled lowland unit; slope component shown locally.	LMA	S	Eaton-Ault area north of Greeley.	A low slightly rolling surface (LMA) slopes very gently southeastward toward the South Platte River bottomland. Windblown sediments largely mask bottomland and terraces. Drainage courses and intervening surfaces are also greatly modified by irrigation systems and by agriculture.	Generally very low. Locally about 100 feet (30.5 m).	About 4,640 to 5,020 feet (1,414.3–1,530.1 m).	Wind-deposited silt and sand covering extensive river gravels and bedrock.
			LMB		Beebe Draw area, south of South Platte River, near east edge of map area.	A broad shallow valley (LMB) without continuous surface drainage. Old channels and terraces are concealed by sheets and dunes of windblown silty sand; the surface is further modified by agriculture and irrigation systems. Well-formed dunes and irregular sand-hill clusters are only partly stabilized by vegetation. Small ponds in some deflation basins; marsh areas in low dune-clogged sections of the valley.	Generally very low; sand hills as much as 40–50 feet (12.2–15.2 m) above valley surface; valley edge locally 40–60 feet (12.2–18.3 m) above valley center.	About 4,680 feet (1,426.5 m) in the north, 5,030 feet (1,533.1 m) in the south.	Gravel-bearing deposits of former stream through Beebe Draw overlain by windblown silty sand that is continuous from the western upland across the valley in sheets or in irregular or U-shaped or southeast-trending ridge-formed dunes.
		Transitional lowland unit; slope component shown locally.	TR	S	Southwest of Loveland; southwest of Longmont; in and east of Boulder, north of Boulder Creek.	Low-lying areas (TR) of very low relief, gradational to adjoining upland and terrace or bottomland units; may be obscurely terraced or contain subdued equivalents of upland units. These units are much modified by agriculture and urban development and are designated only where choice of another category cannot be made satisfactorily. Locally, slope components (S) are mapped.	Very low to a few tens of feet (less than 10 m).	About 4,950–5,150 feet (1,519–1,570 m) near Longmont; 4,990–5,030 feet (1,521–1,533 m) near Loveland; 5,200–5,400 feet (1,585–1,646 m) in Boulder area.	Probably underlain mainly by terrace or upland gravels, covered in part by windblown material.
	FRONT RANGE SECTION OF THE SOUTHERN ROCKY MOUNTAINS PROVINCE — For this map, the part of the Front Range section within the northern Front Range Urban Corridor is divided into lower mountains and hogback subsections. A higher mountains subsection, from about 9,000 feet (2,743 m) to above 14,000 feet (4,267 m), is west of the map area. The lower mountains subsection, mainly below 9,000 feet (2,743 m), is characterized by narrow-crested ridges, deep canyons, and a few high open valleys. Rocks are predominantly granites, gneisses, and schists. The lower mountains are bordered on the east by the north- to northeast-trending hogback subsection of alternating ridges and valleys eroded in steeply tilted beds of resistant sandstones (ridges) and nonresistant shales (valleys). Northward through the map area, the mountain front is offset to the east in several places by earth movements that have affected both crystalline and sedimentary rocks.	Hogback subsection.	Ridge unit; landslide component shown locally.	R	LS	Parallel ridges alternate with valleys throughout the hogback subsection; landslides are common on dip slopes and a few rockfalls are shown (by the same symbol) on scarp slopes.	Ridges are generally sharp-crested and either asymmetric in cross-sectional profile or nearly symmetrical. On asymmetric ridges, the gentler dip surfaces have slopes of less than 8 to about 40 percent (4.5°–20°). The steeper scarp surfaces have about 25 to more than 70 percent slopes (about 14°–35°); a few are steeper or less steep. Subordinate ridges on the slopes of major ridges commonly are separated by valley floors that are not of mappable width. Landslides and related features (LS) form irregular surfaces on many slopes (Colton, Holligan, and Anderson, 1975).	Less than 50 feet (15 m) to about 1,000 feet (305 m); maximum in parts of Boulder-Lyons area.	About 5,100–6,800 feet (1,555–2,073 m).
Valley unit.			V		Between and, in places, cutting across ridges of hogback subsection.	Valleys between ridges are mapped where a change in slope angle, from gentler valley to steeper ridge slope, is recognizable on topographic maps or air photos. Locally, bottomland unit section extends into the hogback belt and are incised into valley surfaces. In such places the valley surfaces resemble terraces of the Piedmont lowlands, but commonly the slope angle (normal to the stream line) is much greater than on terraces. In a few places, colluvium from an adjoining ridge or part of the mountain subsection has filled a valley, largely buried a low ridge, and spilled into a second valley. This process forms a high valley floor, of exceptional width and local relief from the stream at one edge to the colluvial source at the other edge. (See valley southwest of Milner Mountain, northwest of Loveland.)	Less than 40 feet (12.2 m) to about 150 feet (45.7 m), rarely higher.	About 5,100–6,200 feet (1,555–1,890 m).	Valleys are floored with colluvium, stream gravel, or finer grained alluvium. Bedrock may be exposed in some places.
Lower mountains subsection.		Canyon wall unit.	C		Along courses of principal streams and a few tributaries.	Rough, steep to very steep surfaces (C) that rise abruptly from principal streams or their main tributaries; arbitrarily limited to slopes of 40 percent or more. Areas of more moderate slope are present locally within canyon walls or break continuity of one or both walls along some canyon streams. Areas of steep to very steep slope (more than 40 percent) also exist along some smaller stream valleys not mapped as canyons and in other areas of mountain complex (M).	Height of canyon walls as much as 1,500–1,600 feet (457–488 m) above stream level.	About 5,500–8,300 feet (1,676–2,530 m).	Steep-walled canyons are cut in igneous and metamorphic rock. Parts of rock slopes are covered by boulders and more finely broken rock debris (talus deposits and colluvium); in places soil is sufficient to support partial forest cover.
		Valley floor unit.	VF		Along principal streams and a few tributaries; mapped where width of unit permits. Arbitrary boundaries are about 40 feet (12.2 m) or one contour interval above stream level on U.S. Geological Survey 1:24,000-scale topographic maps of this area.	In some areas, a gently sloping to nearly level surface (VF) 500 feet (152 m) or more in width; in other places, much narrower; locally restricted to stream width. Stream gradients in mapped valleys range from less than 2 percent to more than 20 percent.	Very low.	About 5,400–8,200 feet (1,646–2,499 m).	Bouldery and finer grained alluvium in stream channels and local valley flats; alluvium may merge upslope with colluvium of canyon walls.
		Park unit.	P		Scattered in mountain complex areas.	Open unforested, commonly grassy, gently to moderately sloping surfaces that grade into steeper forested slopes. Surfaces are gently undulant to locally rough. For this map a maximum slope of about 15 percent was used (determined from contour maps); local steeper slopes may be included.	About 200–500 feet (61–152 m) from low to high margins of parks; surface irregularities may have 5–50 feet (1.5–15.2 m) of relief.	About 6,600–8,600 feet (2,012–2,621 m).	Colluvium over igneous and metamorphic bedrock and, near Pinewood Lake, over sedimentary rocks like those at the west edge of the hogback subsection of the Front Range. Grassy parks commonly underlain by more deeply weathered material than that which underlies forested mountain slopes. Bedrock exposed in many places. Some high-level gravel deposits present.
Mountain complex unit.	M		All areas of lower mountains subsection not assigned to other categories.	Mountain peaks or crests, cliffs, slopes, and valleys are included, as well as many areas related to other lower mountains subsection categories but not so mapped because of limited extent or lack of definable boundaries.	Slight to more than 2,300 feet (701 m).	About 5,400–9,400 feet (1,646–2,865 m).	Mainly granite and other igneous rocks and metamorphic rocks, in places covered by soil or colluvium.		

LANDFORMS IN THE BOULDER—FORT COLLINS—GREELEY AREA, FRONT RANGE URBAN CORRIDOR, COLORADO

By
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