

**STRATIGRAPHIC COLUMN OF THE ARGENTA-MELROSE AREA**

ERA	PERIOD	SYMBOL	LITHOLOGY	THICKNESS (feet)	UNIT	DESCRIPTION		
Cenozoic		Qal			Quaternary alluvium	Transported gravel, sand, and silt along present-day stream courses.		
		Qf			Quaternary alluvial fans			
		Qvf			Quaternary valley fill	Sandy soil and gravel. Forms broad, graded surfaces locally cut by recent stream channels.		
		Qt			Quaternary talus	Rock slides and talus accumulations beneath steep rock faces.		
		Qm			Quaternary moraine	Glacial moraine often representing more than one period of glaciation.		
		QTc			Quaternary-tertiary cover undivided	Slope-wash soil, weathered talus, residual fragments and reworked Tertiary sediments.		
		Tcgl			Tertiary conglomerate	Bedded tertiary gravels well-cemented with sandy caliche.		
Mesozoic	E. Tertiary to L. Cret.	TKi			Tertiary-Cretaceous intrusion	Tertiary-Cretaceous undivided granitic intrusive rocks.		
		Ki			Cretaceous intrusion	Granitic (mostly quartz-monzonites) intrusive rocks of the Plöber batholith and McCartney Mountain stock.		
	Late Lower Cretaceous to Upper Cretaceous	Kc			2000+ (Brumbaugh, 1973) 4000+ (Myers, 1952) 6000-6500 (Peters, 1971) 6100+ (Sharp, 1970) 4000-5000 (Theodosis, 1956)	Colorado Group undivided	Thick sequence of tuffaceous-rich clastics. Greenish-gray to light-yellowish-gray to grayish-white tuffaceous sub-gray wacke, tuffaceous sandstone, quartz sandstone, and tuff containing local conglomerate lenses. Interbedded with grayish-green, greenish-blue, dark-gray mudstone and siltstone (in part tuffaceous). Locally contains plant fragments.  Massive cobble conglomerate. Rounded to subrounded cobbles and pebbles of chert and quartz arenite up to 2 inches in diameter. Matrix is a poorly sorted medium- to fine-grained "salt and pepper" conglomerate reaches a maximum thickness (~50 feet) along Cherry Creek. Thins to north and south and is present as localized lenses elsewhere in the area.  Gray, grayish-green, and minor dull maroon argillites. Thin- to thick-bedded, dense, well-indurated. Interbedded calcareous and siliceous siltstones, silty shales, shales, mudstones. Thinly laminated to thin-bedded. Minor olive-gray to bluish-gray "salt and pepper" sandstone. Thin- to thick-bedded, fine- to medium-grained. Minor porcellanite.  Tuffaceous component to many of the units.  Pale yellowish to greenish-gray "salt and pepper" sandstone (subfeldspathic lithic arenite). Thin- to thick-bedded, commonly cross-bedded. Interbedded with greenish-gray calcareous mudstones (very thin- to thin-bedded) and grayish-black, well-indurated, fissile carbonaceous shale.  Black calcareous shale	
	Lower Cretaceous	Kk			1000+ (Brumbaugh, 1973) 1350 ± (Myers, 1952) 800-900 (Peters, 1971) 1,412 (Sharp, 1970) 500-600 (Theodosis, 1956)	Kootenai formation	Upper gastropod limestone member. Dark gray to light yellow-gray crystalline limestone (biomicrosparite) (calcirudite) with abundant fresh water gastropods. Thin- to massive-bedded. Interbedded with yellow- to olive-gray and gray sandstone (subfeldspathic lithic arenite). Laminated to thick-bedded. Gray dense, fissile to blocky shale and mudstone. Petrofiferous odor is common. Grayish and reddish sandstone. Fine- to coarse-grained, thin- to thick-bedded. Interbedded with red, grayish red, purple and grayish green siltstone and mudstone. Very thin- to thin-bedded.  Light gray- to pale yellow-orange weathering dense limestone (biomicrite, calcarenite) with thin shale interbeds. Thin- to massive-bedded.  Red, maroon, and green silty shale, mudstone, and siltstone. Very thin- to thin-bedded. Thin interbeds of quartz arenite.  Several zones of grayish- to yellow-brown coarse- to medium-grained lithic sandstone (salt and pepper). Thin- to thick-bedded, cross-laminated. Interbedded with red and green mudstone.  Basal chert pebble conglomerate lenses up to 12 feet thick.	
	Lower Triassic	Trd			500 ± (Brumbaugh, 1973) 438 (Hobbs, 1968) 850-900 (Myers, 1952) 600-650 (Peters, 1971) 530-780 (Sharp, 1970) 275-450 (Theodosis, 1956)	Dinwoody formation	Map unit contains 100 feet of red calcareous siltstone and mudstone of the Jurassic Morrison (?) formation.  Upper member. Gray- to brown-weathering fossiliferous limestone (biomicrite, calcarenite) and calcareous sandstone. Thin- to thick-bedded. Abundant <i>Lingula</i> sp. and <i>Myalina</i> sp.  Lower member. Brownish-gray to olive-gray calcareous mudstone and siltstone with interbedded shale. Laminated to very thin-bedded. Rhyolite, pelecypod molds. Minor thin interbeds of brown weathering fossiliferous near top.  Contact metamorphosed to hornfels and argillites (lower member) and medium- to coarse-crystalline marble with interbedded hornfels (upper member).	
Early to Middle Permian	Pp			300+ (Brumbaugh, 1973) 400-450 (Hobbs, 1968) 285-410 (Myers, 1952) 150-200 (Peters, 1971) 360 (Sharp, 1970) 185-372 (Theodosis, 1956)	Phosphoria formation	Upper. Gray to yellow-brown chert orthoquartzite, chert siltstone, quartzite and minor cross-bedded sandstone. Very thin- to thick-bedded. Locally cross-laminated. Dark gray to black carbonaceous and phosphatic mudstone and petrofiferous mudstone very thin- to thin-bedded. Gray-brown to gray-brown phosphatic pebble mudstone and phosphate pebble sandstone. (Colophane pebbles of cryptocrystalline fluorapatite enclosed in a carbonaceous matrix. Pebbles weather bluish white).  Grayish white, gray, and gray- and yellow-brown arenaceous chert and chert-quartz arenite. Thin- to massive-bedded. Cherty, siliceous dolomitic limestone. Massive-bedded. Grey, gray black, black, and brown massive and fragmented chert and siliceous limestone. Thin silty shale interbeds to massive-bedded. Basal, gray-orange to dark yellow-orange sandy siltstone. Quartz cement.		
Middle Penn.	Ipq			300-500 (Brumbaugh, 1973) 650 (Hobbs, 1952) 650 ± (Peters, 1971) 931 (Sharp, 1970) 220-450 (Theodosis, 1956)	Quadrant quartzite	Brown to cream colored quartzite.  Thin- to very thick-bedded, generally cross-bedded. Texturally mature, nearly monomineralic. Liesegang banding, rusty weathering. Secondary quartz overgrowths. Calcite cement and local limonitic sandstone at top. Degree of cementation varies laterally and vertically. Low to very low porosity.		
L. Miss. to E. Penn.	M-IPa			300 ± (Hobbs, 1968) 240-550 (Myers, 1952) 250 ± (Peters, 1971) 275-353 (Sharp, 1970) 214-363 (Theodosis, 1956)	Amsden formation	Upper. Dark gray to blue-gray dense fossiliferous limestone (biomicrite) thin- to thick-bedded chert nodules and beds common. Maroon and green siltstones with yellow-green and maroon speckling. (4 1/2 to 1 1/2 in diameter). Increasingly sandy towards top grades into quadrant formation. Lower. Basal pale red subarkose thin-bedded with rare internal cross-laminations. Low porosity. Grayish- to pale red siltstone. Very thin-bedded. Poorly exposed. Contact metamorphosed to hornfels and argillites.		
Paleozoic	Lower Middle Miss.	Mmc			1,700 ± (Hobbs, 1968) 1,300 ± (Myers, 1952) 1,120 ± (Sharp, 1970) 900-1,000 (Theodosis, 1956)	Mission Canyon limestone	Light gray to medium-gray fossiliferous limestone (biomicrite, calcarenite) thin- to massive-bedded, granular to coarsely granular. Minor thin-bedded dolomitic limestone. Common oolitic and pseudo-oolitic limestone. Consisting of crinoid debris. Common black and brown nodular and bedded cherty zones (increase upwards). Low porosity. Recrystallizes to massive white marble.	
	Lower Miss.	Mml	Mmu			900 ± (Hobbs, 1968) 750-950 (Myers, 1952) 850+ (Sharp, 1970)	Madison Group undifferentiated	Upper. Bluish-gray limestone, thin- to medium-bedded chert, dense. Cyclic repetitions of thin- to massive-bedded, dense fragmental and crinoid limestone towards top (fossiliferous micrite).  Lower. Dark blue-gray micrite and dismicrite interbedded with thin calcareous shale parting. Thin-bedded, dense, fine-grained. Rare discoidal chert nodules parallel to bedding.
	Uppermost Devonian	Dt			175+ (Myers, 1952) 350-400 (Hobbs, 1968)	Three Forks formation	Poorly exposed (in ascending order): Calcareous siltstone, variable amounts of interbedded orange, very thin-bedded. Very pale orange to light olive gray fissile shale. Pale red blocky mudstone. Gray to light olive-gray argillaceous micrite.	
	Upper Devonian	Dj			441+ (Wilson, 1953) 600 (Hobbs, 1968) 650-700 (Myers, 1952)	Jefferson dolomite	Upper. Black to gray-black saccharoidal dolomite, thin- to massive-bedded, variable amounts of interbedded limestone and lime dolomite. Fossiliferous, calcite-filled, calcite-filled breccia with moderate porosity.  Lower. Dark gray, sandy saccharoidal dolomite. Thin- to massive-bedded, reddish color. Minor interbeds of light gray thin-bedded dolomite, laminated oolitic limestone, vugular dolomite.  Discoidal chert nodules (parallel to bedding) and "spaghett structure" common throughout. ("spaghett structure" is lighter-colored dolomite replacement of stromatoloids and <i>Alpinophora</i> ).	
	Late Mid. to Upper Cambrian	€rl			75 (Hanson, 1952)	Red Lion formation	Tan, purple, and purplish-gray siltstone. Thin-bedded upper. Buff to medium gray, fine- to coarsely crystalline dolomite.	
	U. Middle Cambrian	€pa	€ch			126 (Hanson, 1952) 800+ (Hobbs, 1968)	Madison Formation	Light gray to medium gray dolomite with light brownish-gray microcrystalline dolomitic limestone mottling. Fine- to coarsely crystalline. Increasingly sandy towards top of formation.  Poorly exposed limestone and fossiliferous limestone interbedded with tan and gray fissile shale. Lower interbedded dolomite and gray psilicite and crystalline limestone.  Gray to black limestone and dolomitic limestone with gray dolomitic mottling. Weathers light gray to brownish-drab. Local wormtrails, wavy laminations, crossbeds, intraformational conglomerate. Fine- to coarsely crystalline.
	Middle Cambrian	€w			200 ± (Myers, 1952) 271 (Hanson, 1952)	Wolsey shale	Greenish- to brownish- to purplish-gray micaceous shale with variable amounts of finely interbedded brownish gray dolomite and lenses of brown glauconitic sandstone. Poorly exposed.	
Middle Cambrian	€f			71 (Hanson, 1952)	Flathead quartzite	Reddish-pink to light tanish gray vitreous quartzite and siliceous sandstone. Thin- to thick-bedded. Middle part thin-bedded with purple shale partings and interbeds. Common cross-bedding and ripple marks.		
Precambrian	Middle Proterozoic	p-€b3			4000-5000+ (Myers, 1952) 700+ (Hobbs, 1968)	Belt Supergroup (Upper Missoula Group equivalents?)	Pale red to light gray vitreous orthoquartzite with minor interbedded micaceous argillite and local cobble conglomerate. Thin- to very thick-bedded, asymmetrical ripple marks, thin sets of cross lamination. Fine- to coarse-grained, moderately well sorted, subrounded to well-rounded.	
	Middle Proterozoic	p-€b2			1000+ (Myers, 1952) 650+ (Hobbs, 1968)	Belt Supergroup (Upper Missoula Group equivalents?)	Varicolored micaceous argillite with minor interbedded subarkose (red, green, and gray). Distinctly laminated to thin-bedded. Asymmetrical ripple marks, polygonal mudcracks, rare mudcasts.	
Middle Proterozoic	p-€b1			2000-8500+ (Myers, 1952) 2000+ (Hobbs, 1968)	Belt Supergroup (Upper Missoula Group equivalents?)	Reddish, purplish, and pinkish feldspathic quartzite. Thin- to very thick-bedded. Ubiquitous cross-laminations, rare argillite chips, rare scour and fill structures. Medium- to coarse-grained, subangular to subrounded, moderately well sorted.		
Archean	p-€g				Crystalline basement rock	Sillimanite-garnet-biotite quartzofeldspathic gneiss and schist.		