

SYSTEM	SERIES	GROUP	FORMATION AND MEMBER	LITHOLOGY	THICKNESS, IN FEET	DESCRIPTION
CRETACEOUS	Upper Cretaceous		Eagle Sandstone		535	Massive to well-bedded medium- to well-sorted light-olive-gray arkosic sandstone and siltstone. Some beds are calcareous. Most beds contain a heavy-mineral suite. Above Virgelle Sandstone Member and at the top of the formation are coal zones containing coal beds and carbonaceous siltstones.
			Virgelle Sandstone		110	Hard massive to crossbedded very light gray, generally fine grained, arkosic sandstone. Contains a heavy-mineral suite and a few channel-fill conglomerate beds. A few lenticular beds of sandstone derived from volcanic rocks are near the middle of the unit.
			Telegraph Creek Formation		285	Massive to thin-bedded light-olive-gray very fine grained calcareous, arkosic sandstone and siltstone.
			Upper shale		575	Massive to thin-bedded silty calcareous, micaceous dark-gray shale with interbedded very fine to fine-grained calcareous, arkosic sandstone and siltstone. Most sandstone beds contain a heavy-mineral suite.
			Cody Shale	Eldridge Creek	120	Platy to thin-bedded very fine grained glauconitic fossiliferous greenish-gray sandstone. Contains a heavy-mineral suite.
			Lower shale		590	Thin- to medium-bedded silty calcareous, micaceous, glauconitic dark-gray shale with interbedded siltstone and thin-bedded very fine grained sandstone.
			Frontier Formation		295	Massive to thin-bedded crossbedded greenish- and yellowish-gray very fine to fine-grained calcareous sandstone with interbedded siltstone. Contains a heavy-mineral suite. Chert-pebble conglomerate 280 feet above base.
			Boulder River Sandstone		120	Massive to thin-bedded crossbedded grayish-green, very fine to fine-grained, calcareous micaceous glauconitic indurated sandstone. Contains a heavy-mineral suite.
			Mowry Shale		465	Massive to thin-bedded silty micaceous dark-gray to dark-brown shale with occasional interbeds of siltstone, sandstone, and bentonite.
			Lower Cretaceous			Upper sandstone
Thompson's Shale	Middle shale	375				Massive to thin-bedded dark-gray to very dark gray shale with siltstone in lower part.
Lower sandstone		40				Thin- to thick-bedded fine-grained quartzose yellowish-gray sandstone.
Kootenai Formation		260				Massive to thin-bedded sand grayish-red and grayish-green mudstone and shale with interbedded sandstone, siltstone, and limestone.
Pryor Conglomerate		25				Massive crossbedded chert-pebble conglomerate and sandstone.

KOOTENAI FORMATION, THERMOPOLIS SHALE, MOWRY SHALE, FRONTIER FORMATION, CODY SHALE, TELEGRAPH CREEK FORMATION, AND EAGLE SANDSTONE

SYSTEM	SERIES	GROUP	FORMATION AND MEMBER	LITHOLOGY	THICKNESS, IN FEET	DESCRIPTION
JURASSIC	Upper Jurassic		Morrison Formation		400	Concealed, probably dark-gray carbonaceous siltstone and fine-grained sandstone. Siltstone, reddish-gray, some interbedded fine-grained sandstone, poorly exposed. Sandstone, massive, crossbedded, fine-grained, calcareous, gray, interbedded siltstone. Concealed, probably red siltstone. Sandstone, massive to thin-bedded, crossbedded, fine-grained, calcareous, gray, interbedded siltstone. Siltstone, olive- to brownish-gray. Sandstone, massive to thin-bedded, crossbedded, fine- to very fine-grained, calcareous, gray to brownish-gray, interbedded reddish-gray siltstone. Concealed, probably siltstone.
			Ellis		80	Sandstone, thick-bedded, fine-grained, glauconitic, light-gray, fossiliferous. Limestone, massive, sandy, bluish-gray, fossiliferous. Sandstone, thin-bedded, fine-grained, silty, slightly glauconitic, dark gray, conglomeratic at base. Shale, calcareous, medium-gray, interbedded limestone, fossiliferous. Limestone, thick-bedded, oolitic, hard, fossiliferous, forms prominent ridges. Shale, chunky, silty, mottled maroon and olive-green, poorly exposed. Concealed, probably shale.
			Piper Formation		140	Limestone and calcareous shale, thin- to medium-bedded, medium-gray, fossiliferous. Sandstone, massive, thin- to medium-bedded, conglomeratic at base, fossiliferous. Sandstone and chert, conglomeratic at base.
			Phosphoria Formation		105	Quartzite, massive, yellowish-gray, contains many irregular beds of siltstone; forms prominent cliffs. Concealed, probably sandy siltstone. Quartzite, massive, yellowish-gray, contains many irregular beds of siltstone; forms prominent cliffs. Limestone, massive to thin-bedded, pale reddish- to yellowish brown. Dolomite, thin- to thick-bedded, pale brown.
			Amnsden Formation		100	Siltstone, red, calcareous, some shale and thin-bedded fine-grained limestone at base. Limestone, massive, light-olive-gray, cherty near base, forms prominent cliffs. Limestone, massive, silty, dolomitic, light-olive-gray, interbedded grayish-red siltstone. Dolomite, thin- to thick-bedded, pale brown.
			Upper member		325	Limestone, massive, silty, cherty, light-olive-gray, interbedded grayish-red siltstone. Dolomite, massive, mottled reddish-gray, fossiliferous at base, forms prominent ridges. Limestone, massive to poorly bedded, dolomitic, light-olive-gray, fossiliferous at top; forms prominent ridges. Dolomite, massive, light-olive-gray to yellowish-brown. Solution breccia, contains fragments of pebbles; to boulder-size dolomite. Dolomite, massive to poorly bedded, calcitic, light-olive-gray, forms prominent ridges. Limestone, massive to poorly bedded, silty in part, cherty near top, light-olive-gray.
			Lower member		325	Dolomite, massive, calcitic, cherty, light-olive-gray, some dolomitic limestone near base; fossiliferous; forms prominent ridges. Limestone, massive, light-olive-gray, forms prominent ridges. Dolomite, massive to thin-bedded, cherty, light-olive-gray, forms prominent ridges. Limestone, massive, dolomitic, oolitic, light-olive-gray, fossiliferous; forms prominent ridges. Dolomite, thin- to thick-bedded, calcitic, olive-gray, fossiliferous.
			Lodgepole Limestone		480	Limestone, thin- to thick-bedded, dolomitic, light-olive-gray, interbedded shale or siltstone. Limestone, thin- to thick-bedded, magnesian, light-olive-gray, interbedded shale or siltstone, fossiliferous. Limestone, massive to medium bedded, cherty, olive-gray, fossiliferous. Limestone, thin- to thick-bedded, dolomitic, cherty, olive- to medium gray, fossiliferous.
			Three Forks Shale		87	Shale, black. Dolomite, thin- to thick-bedded, grayish-orange to yellowish-brown, interbedded shale. Shale, calcareous, dusky-yellow-green, fossiliferous, poorly exposed. Dolomite, massive to poorly bedded, pale brown; forms prominent cliffs.
			DEVONIAN	Upper Devonian		Jefferson Dolomite
Maywood Formation		30				Shale and limestone, greenish-gray shale with interbedded glauconitic gray limestone.
Bighorn Dolomite		90				Limestone, light-gray, dense, some flat-pebble limestone conglomerate. Shale, grayish-green, flat-pebble limestone conglomerate at base.
Grove Creek Formation		50				Limestone, dolomitic, oolitic, gray, silty near base, chert zone at top; forms prominent cliffs.
Snowy Range Formation		175				Shale, grayish-green, and gray glauconitic limestone with some flat-pebble conglomerate. Shale, greenish-gray.
Pilgrim Limestone		175				Shale, grayish-green, and gray limestone with some flat-pebble conglomerate.
Park Shale		80				Limestone, thin-bedded, gray, and interbedded greenish-gray shale, fossiliferous.
Meagher Limestone		125				Shale, greenish- to purplish-gray; some interbedded limestone and flat-pebble glauconitic limestone conglomerate.
Wolsey Shale		120				Quartzite and sandstone, reddish-gray; conglomerate at base.
PRE-CAMBRIAN	Middle Cambrian					Flathead Quartzite

PALEOZOIC AND JURASSIC ROCKS

EXPLANATION



STRATIGRAPHIC COLUMNS OF ROCKS EXPOSED IN THE AREA WEST OF LIVINGSTON, GALLATIN, AND PARK COUNTIES, MONTANA

SYSTEM	SERIES	GROUP	FORMATION	MEMBER	LITHOLOGY	THICKNESS, IN FEET	DESCRIPTION					
CRETACEOUS	Upper Cretaceous	Livingston	Fort Union Formation		Upper calcareous sandstone	1800	Overlying rocks eroded. Massive to thin-bedded crossbedded fine-grained to conglomeratic calcareous, andesitic, ridge-forming greenish-gray sandstone. Pebbles of volcanic rock, quartzite, gneiss, granite, limestone, sandstone, and claystone. Contains wood and plant fragments.					
						3840	Massive to thin-bedded fine- to coarse-grained, slightly calcareous, andesitic greenish-gray sandstone and massive olive-gray mudstone. Contains plant fragments, spores, and vertebrates.					
						975	Massive to thin-bedded crossbedded fine-grained to conglomeratic andesitic ridge-forming dusky-yellow-green sandstone with interbedded siltstone and claystone. Pebbles of volcanic rock, quartzite, gneiss, and limestone. Contains leaf impressions, spores, and fresh-water mollusks.					
						825	Massive to thin-bedded crossbedded poorly sorted ridge-forming andesitic dusky yellow-green sandstone with interbedded claystone and siltstone. Locally conglomeratic. Contains fresh-water mollusks and wood and plant fragments.					
						2590	Massive olive-gray to grayish-red claystone with interbedded fine- to coarse-grained andesitic sandstone. Contains petrified wood, leaf impressions, spores, and dinosaur bones. Generally a valley-forming unit.					
						1190	Massive tuffaceous olive-gray siltstone with interbedded fine-grained andesitic sandstone. Contains petrified wood, leaf impressions, spores, and dinosaur bones. Heulandite in the form of red specks or veinlets is common.					
						160	Massive crossbedded poorly sorted grayish-green andesitic ridge-forming sandstone with interbedded tuff and bentonite.					
						1550	Massive to thin-bedded poorly sorted andesitic olive-gray siltstone and sandstone with interbedded conglomerate, claystone, and tuff. Thin beds of bentonite and lignite in the lower part of the formation. Contains petrified wood, leaf impressions, spores, fresh-water mollusks, and dinosaur bones.					

TYPE SECTION OF LIVINGSTON GROUP