

GENERAL OUTCROP SECTION OF THE BLACK HILLS AREA				
	FORMATION	SECTION	THICKNESS IN FEET	DESCRIPTION
TERTIARY	QUATERNARY	SANDS AND GRAVELS	0-50	Sand, gravel, and boulders.
	PLIOCENE	OGALLALA GROUP	0-100	Light colored sands and silts.
	MIOCENE	ARIKAREE GROUP	0-500	Light colored clays and silts. White ash bed at base
	OLIGOCENE	WHITE RIVER GROUP	0-600	Light colored clays with sandstone channel fillings and local limestone lenses
TERTIARY	PALEOCENE	TONGUE RIVER MEMBER	0-425	Light colored clays and sands, with coal-bed farther north.
		CANNONBALL MEMBER	0-225	Green marine shales and yellow sandstones, the latter often as concretions.
		LUDLOW MEMBER	0-350	Somber gray clays and sandstones with thin beds of lignite.
	?	HELL CREEK FORMATION (Lance Formation)	425	Somber-colored soft brown shale and gray sandstone, with thin lignite lenses in the upper part. Lower half more sandy. Many loglike concretions and thin lenses of iron carbonate.
CRETACEOUS	UPPER	FOX HILLS FORMATION	25-200	Grayish-white to yellow sandstone
		PIERRE SHALE	1200-2000	Principal horizon of limestone lenses giving teepee buttes Dark-gray shale containing scattered concretions. Widely scattered limestone masses, giving small teepee buttes
		Sharon Springs Mem.		Black fissile shale with concretions
		NIOBRARA FORMATION	100-225	Impure chalk and calcareous shale
		Turner Sand Zone		Light-gray shale with numerous large concretions and sandy layers.
		CARLILE FORMATION	400-750	Dark-gray shale
		Wall Creek Sands		Impure slabby limestone. Weathers buff.
		GREENHORN FORMATION	(25-30) (200-350)	Dark-gray calcareous shale, with thin Orman Lake limestone at base.
	LOWER	BELLE FOURCHE SHALE	300-550	Gray shale with scattered limestone concretions. Clay spur bentonite at base.
		MOWRY SHALE	150-250	Light-gray siliceous shale. Fish scales and thin layers of bentonite
		NEWCASTLE SANDSTONE	20-60	Brown to light yellow and white sandstone.
		SKULL CREEK SHALE	170-270	Dark gray to black shale
		FALL RIVER [DAKOTA (?) ss	10-200	Massive to slabby sandstone.
		Fuson Shale	10-188	Coarse gray to buff cross-bedded conglomeric ss, interbedded with buff, red, and gray clay, especially toward top. Local fine-grained limestone.
		Minnewaste ls	0-25	
			25-485	
JURASSIC		MORRISON FORMATION	0-220	Green to maroon shale. Thin sandstone.
		UNKPAPA SS	0-225	Massive fine-grained sandstone.
		SUNDANCE FM	250-450	Greenish-gray shale, thin limestone lenses Glauconitic sandstone; red ss. near middle
		GYPSUM SPRING	0-45	Red siltstone, gypsum, and limestone
TRIASSIC	?	SPEARFISH FORMATION	250-700	Red sandy shale, soft red sandstone and siltstone with gypsum and thin limestone layers. Gypsum locally near the base.
PERMIAN		Goose Egg Equivalent		
		MINNEKAHTA LIMESTONE	30-50	Massive gray, laminated limestone.
		OPECHE FORMATION	50-135	Red shale and sandstone
PENNSYLVANIAN		MINNELUSA FORMATION	350-850	Yellow to red cross-bedded sandstone, limestone, and anhydrite locally at top. Interbedded sandstone, limestone, dolomite, shale, and anhydrite. Red shale with interbedded limestone and sandstone at base.
		PAHASAPA (MADISON) LIMESTONE	300-630	Massive light-colored limestone. Dolomite in part. Cavernous in upper part.
DEVONIAN		ENGLEWOOD LIMESTONE	30-60	Pink to buff limestone. Shale locally at base.
ORDOVICIAN		WHITEWOOD (RED RIVER) FORMATION	0-60	Buff dolomite and limestone.
		WINNIPEG FORMATION	0-100	Green shale with siltstone
CAMBRIAN		DEADWOOD FORMATION	10-400	Massive, buff sandstone. Greenish glauconitic shale, flaggy dolomite and flatpebble limestone conglomerate. Sandstone, with conglomerate locally at the base.
PRE-CAMBRIAN		METAMORPHIC and IGNEOUS ROCKS		Schist, slate, quartzite, and arkosic grit. Intruded by diorite, metamorphosed to amphibolite, and by granite and pegmatite.

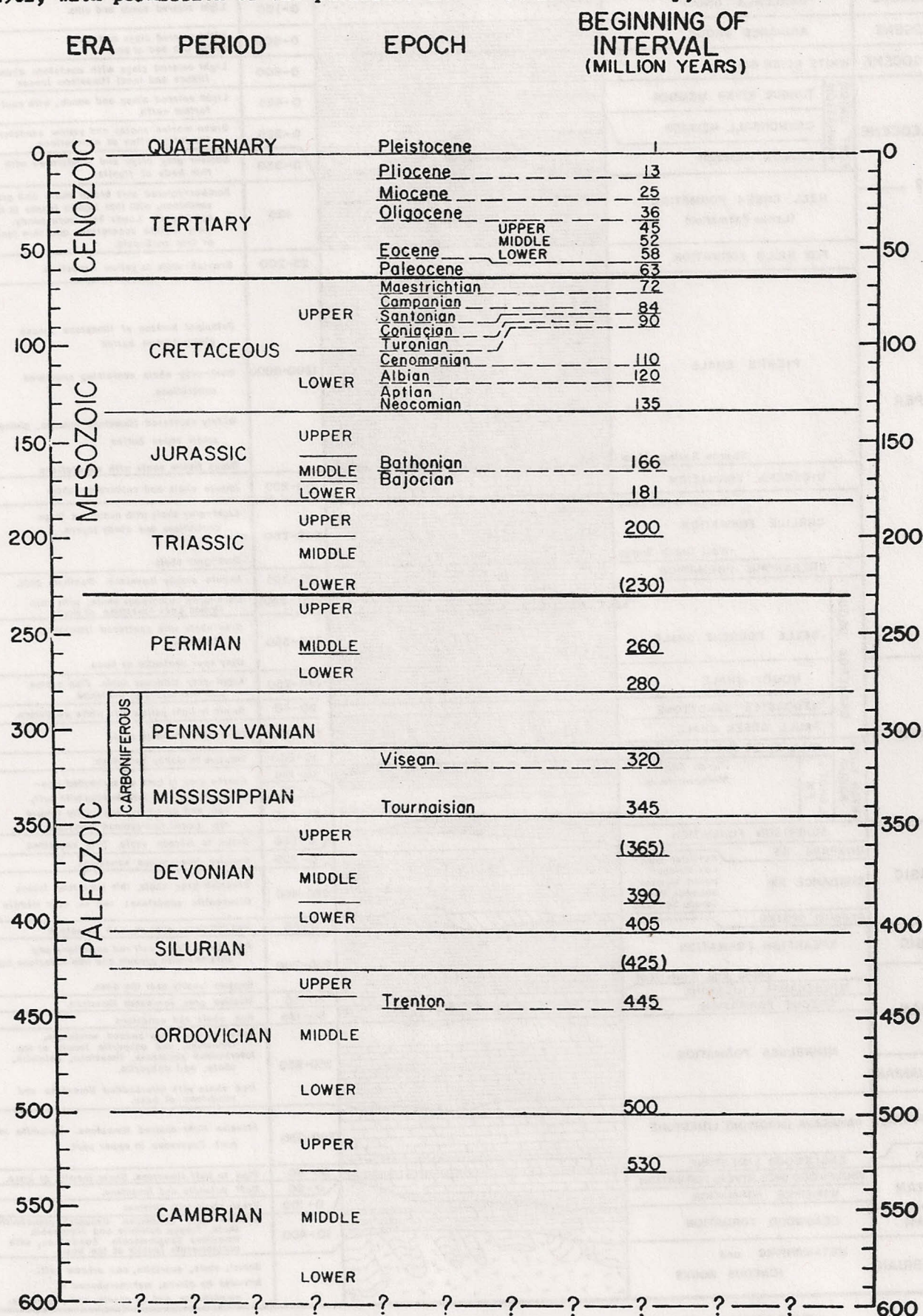


Fig. 1. Geologic time scale.