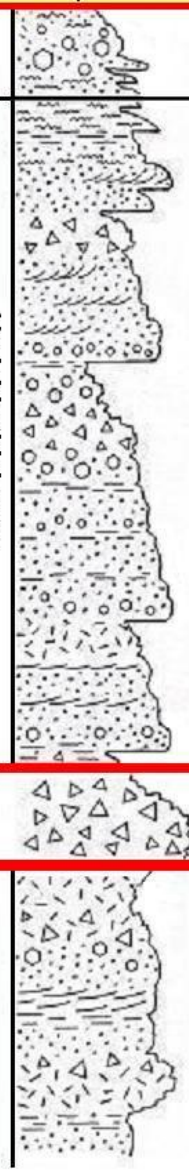
Timeline

The geologic timeline below is calibrated in 5-million-year blocks of time. The rock profile shows the geologic formations as diagrams using conventional symbols:
Circles and dots represent gravel and sand (sandstone and conglomerate);
Curved or angled dashes mean ripples or dunes (sandstone);
Horizontal dashes mean mud and clay (shales);
“Bricks” mean calcium carbonate layers (limestone);
Triangles mean volcanic rock (lava or ash layers);
Random dashes indicate igneous rock (granite or basalt);
Steep or vertical profile edge means a cliff or very steep slope on the rock outcrop (hard or protected rock);
“Stairsteps” mean layers of rock forming caps or ledges (very hard or resistant rock);
Sloping profile edge means a shallow or low slope on the rock outcrop (soft or easily weathered rock)

Gaps in the rock profile mean that there was no rock deposited during that time period, or else the existing rock from that time period was eroded and removed during later time, leaving no rock record in this area.

GEOLOGIC TIME YEARS AGO *ERA/PERIOD*	ROCK FORMATIONS THICKNESS NAME *PROFILE* *LOCATION*	GEOLOGIC EVENTS PAGOSA COUNTRY *WORLDWIDE*	LANDFORM & ECOLOGY PAGOSA COUNTRY *WORLDWIDE*
The red line below represents the last 12,000 years. All recorded human history would fit within the topmost 1/2 of the thickness of the line.			
12,000 - Today 1.8 Million *QUATERNARY*	Sediments & landslides *Everywhere*	Interglacial period begins- warming climate Drying climate, less rain & snow end heavy erosional period; modern landscapes are formed	Glaciers melt- first people settle Pagosa Modern mountains & valleys *Mass extinctions* Yellowstone-type landforms & ecology
TERTIARY **5 Million**	Glacial till *East Fork valley* Travertine *Hot Springs* Volcanic breccia *Wolf Creek summit*	Ice Age, Hot Springs- intense glacial erosion of old volcanic mountains begins to carve out local landforms Last local volcanic eruptions end	Glaciers fill East Fork, upper San Juan River valleys up to 1/2 mile deep with ice *Isthmus of Panama connects N. & S. America* *Worldwide climate changes- Ice Age begins* *First humans?* *Red Sea opens*
10 Million	Volcanic & intrusive igneous rocks *Jackson Mountain* *Wolf Creek Pass* *Trujillo-Pinon Hills*	Rio Grande Rift stops spreading Minor volcanic eruptions continue Jackson Mountain erupts; probable fissure eruptions in Archuleta dike swarm (Pinon Hills) Jackson Mountain laccolith; Blanco Basin & Archuleta dikes intruded into fractures	*Antarctic ice sheet expands greatly* Wet, cool climate; wetlands & geysers dominate across Pagosa area Periodic volcanic eruptions continue to cause local devastation Forests recover
15 Million	Volcanic rocks & sediments deposited between eruptions		
20 Million	Gold, silver, base metal ores & gangue minerals *Summitville* *Lake City* *Silverton* *Creede*	Hydrothermal mineral deposits form within volcanic centers	Caldera eruptions end; local minor volcanism destroys local forests; slow recovery of ecology 21 MA-Summitville hydrothermal ore deposits form 22 MA- Lake City caldera eruption 27 MA- Silverton caldera eruption 28 MA- Creede, Platoro, Summitville caldera eruptions
25 Million			
28.8 Million	Fish Creek Tuff *Treasure Mountain* *Wolf Creek Pass*	La Garita Caldera eruption: 1,500 cubic miles of rock blown across North America- 10,000 times as powerful as Mt. St. Helens 1980 eruption	Four Corners ecology devastated; 20,000 square miles destroyed by blast & falling debris- forest fires, choked rivers, smothered plants & animals
30 Million	Treasure Mountain Tuff *Wolf Creek Overlook* *Treasure Mountain* *San Juan River cliffs: the Boot Jack* *East Fork cliffs: the Clamshell*	Giant volcanoes reach 20,000 feet; largest eruptions on Earth Creation of the San Juan Volcanic Field Rio Grande Rift opens: volcanoes build across the Four Corners area	Extreme ecological change- intense eruptions destroy forests, followed by recovery, followed by destruction over many cycles of thousands of years *First elephants* Ecozones change as mountains raise the land and alter weather patterns
35 Million			



GEOLOGIC TIME YEARS AGO *ERA/PERIOD*	ROCK FORMATIONS THICKNESS *PROFILE*	NAME *LOCATION*	GEOLOGIC EVENTS PAGOSA COUNTRY *WORLDWIDE*	LANDFORM & ECOLOGY PAGOSA COUNTRY *WORLDWIDE*
40 Million **45 Million**	750 ft	Blanco Basin Formation *Upper Blanco Basin* *East Fork valley*	Vast alluvial fans build across Pagosa, burying older Animas Formation river channel deposits	*First rodents* Huge river systems support temperate forests, floodplains and swamps, periodically drowning the land in widespread floods
50 Million **55 Million**	2600 ft	Animas Formation *Cabezon Canyon* *Deep Canyon* *Yellowjacket Pass*	Period of intense mountain-building as Rocky Mountains rise to the northeast; river systems carry erosional debris across old Inland Seaway basin	*First horses* *India collides with Asia, raising Himalaya Mtns.* Pagosa is a mix of rivers, alluvial fans and lakes *First grasses* *First primates* *Spectacular diversification of mammals into most former dinosaur ecological niches*
60 Million *TERTIARY*			Continued dumping of sediment across area Seismic shock wave creates sand volcano in Pictured Cliffs sand north of Jackson Mountain?	*Dinosaur ecology gone; slow recovery as mammals, birds begin to spread* 150-mile-wide impact crater boils; volcanic eruptions and tsunamis batter Gulf of Mexico; worldwide climate cooled for decades
65 Million		Animas Formation *Peterson Gulch*	Chixulub Asteroid impact in Yucatan; Pagosa area destroyed 4 minutes after impact	*Worldwide destruction- 75% of all life forms die out; 50% of world's forests burn*
CRETACEOUS	550 ft	Fruitland Formation	River sediment buries swamps and lakes Vast floodplains and swamps fill old inland seaway basin	River deltas change to open plains Floodplains, swamps, clam flats, tidal flats, shoreline dunes and lagons dominate landscape
70 Million **75 Million**		Pictured Cliffs Sandstone *Chimney Rock* Lewis Shale *Chimney Rock*	Shoreline beaches, dunes, lagoon & tidal flats replace sea as land rises to north and east Increasing amount of sand washes into seaway basin as Colorado Plateau rises; sand layers replace mud as dominant sediment deposit Colorado Plateau rises gradually, beginning the final emptying of the Cretaceous Inland Seaway	Beaches, tidal flats, dunes, river deltas and lakes support palm forests, subtropical ecology *India breaks away from Antarctica and begins rapid movement to north*

GEOLOGIC TIME YEARS AGO *ERA/PERIOD*	ROCK FORMATIONS THICKNESS *PROFILE*	 NAME *LOCATION*	GEOLOGIC EVENTS PAGOSA COUNTRY *WORLDWIDE*	LANDFORM & ECOLOGY PAGOSA COUNTRY *WORLDWIDE*
80 Million *CRETACEOUS*	2600 ft	Lewis Shale *Chimney Rock* *At Last Ranch area*	Period of mountain-building- rise of modern Rocky Mountains Increasing floods wash sand into shallowing sea Shallow ocean floor; stagnant, anoxic, organic-rich mud	Valle Seco Mosasaur dies
85 Million			Subsidence- Pagosa sinks beneath the waves again	Ocean replaces beaches, islands
	100 ft	Mesa Verde Group	Brief uplift drains ocean; Pagosa remains near the shoreline	Sand beaches & palm forests, islands, deltas, swamps- beach-front Pagosa; sub-tropical climate
90 Million	2400 ft	Mancos Shale *Bedrock of Pagosa Springs*	Shallow ocean floor- 300 feet deep; layers of stagnant carbon-rich mud build up at about 1 inch every 1,000 years	Oysters, clams, ammonites, fish, reptiles all leave fossil evidence of the local ecology
95 Million				
	250 ft	Dakota Sandstone	Brief period of uplift brings shoreline of inland sea closer to Pagosa	Shallow sea floor, tidal flats, river deltas & floodplains, beaches
100 Million		*Bedrock of Pagosa Lakes*		
105 Million			Long period of erosion erases rock record from 140 Million to 102 Million years; no rocks remain from these ages in the Pagosa area	Pagosa goes underwater!
110 Million			Cretaceous Inland Seaway opens from Canada to Mexico, gradually drowning the land from the north to the south	
115 Million				

GEOLOGIC TIME YEARS AGO *ERA/PERIOD*	ROCK FORMATIONS THICKNESS NAME *PROFILE* *LOCATION*	GEOLOGIC EVENTS PAGOSA COUNTRY *WORLDWIDE*	LANDFORM & ECOLOGY PAGOSA COUNTRY *WORLDWIDE*
120 Million			*First magnolia trees* *First flowering plants*
125 Million		Long period of erosion erases rock record from 140 Million to 102 Million years; no rocks remain from these ages in the Pagosa area	
130 Million			
135 Million			*Dinosaur ecologies recover* *India-Australia land mass separates from Antarctica*
CRETACEOUS	100 ft Burro Canyon Form. *Piedra Canyon*	Brief uplift of Colorado Plateau *Major extinctions worldwide*	Tidal flats, beach sands
140 Million		Erosion removes rock record	*Dinosaur, sea reptile species die* *First birds*
JURASSIC			
144 Million		*Morokweng Asteroid impact in Africa*	Swamps, rivers, lakes
145 Million	800 ft Morrison & Wanakah Formations	Gradual sinking & flooding of land as mountains rise to the east	Shallow lakes, river deltas & floodplains
	250 ft Entrada Sandstone	Arid high plains	Desert sand dunes, alkali lake beds
150 Million	*Upper Piedra River Canyon*	Long period of erosion erases rock record from 197 Million to 152 Million years; no rocks remain from these ages in the Pagosa area	
155 Million			

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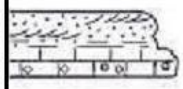
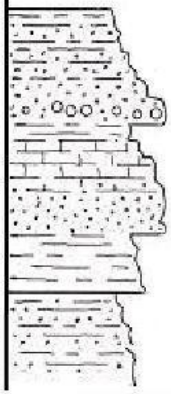
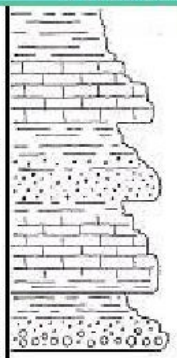
160 Million ***JURASSIC***			Quiet stable period of low-relief plains and deserts	Alkali deserts and salt flats; periodic flooding
				South Atlantic Ocean opens
165 Million			Long period of erosion erases rock record from 197 Million to 152 Million years; no rocks remain from these ages in the Pagosa area	*South America separates from West Africa*
170 Million				
				North Atlantic Ocean opens
175 Million			Period of slow uplift; draining of seas and erosion of land	
180 Million				
185 Million			Erosion of ancestral Rocky Mountains to northeast	
190 Million				*Gulf of Mexico opens*
195 Million	600 ft 	Dolores Formation *Upper Piedra River canyon*	Floodplains, swamps and river deltas	*North America separates from North Africa* Dinosaurs rule Pagosa!

GEOLOGIC TIME YEARS AGO *ERA/PERIOD*	ROCK FORMATIONS THICKNESS NAME *PROFILE* *LOCATION*	GEOLOGIC EVENTS PAGOSA COUNTRY *WORLDWIDE*	LANDFORM & ECOLOGY PAGOSA COUNTRY *WORLDWIDE*
200 Million **205 Million** ***JURASSIC***		Long period of erosion erases rock record from 270 Million to 200 Million years; no rocks remain from these ages in the Pagosa area	
208 Million ***TRIASSIC***			
210 Million **215 Million**			*Pangea supercontinent begins slow breakup*
220 Million **225 Million**		Widespread arid climate across southwest North America	Low hills, deserts and plains
230 Million **235 Million**			*Dinosaurs dominate all major land and air ecologies; mammals and reptiles remain small and subordinate* *First saurischian (lizard-like) dinosaurs* *First ornithischian (bird-like) dinosaurs*

GEOLOGIC TIME YEARS AGO *ERA/PERIOD*	ROCK FORMATIONS THICKNESS *PROFILE*	NAME *LOCATION*	GEOLOGIC EVENTS PAGOSA COUNTRY *WORLDWIDE*	LANDFORM & ECOLOGY PAGOSA COUNTRY *WORLDWIDE*
240 Million			Ancestral Rocky Mountains rise; erosion dumps sediment into San Juan Basin	Pagosa rises with the mountains; dry uplands replace alkali lakes and salt flats
245 Million ***TRIASSIC***			Deserts stretch across Colorado	*Pangea supercontinent combines 95% of all land masses on Earth*
248 Million ***PERMIAN***				*Gradual recovery of reptiles and mammals replaces Permian amphibian ecology*
250 Million			*Permian Extinction Event- cause is uncertain*	*90% of all life forms on Earth die out; planetary ecology radically changed forever*
255 Million			Long period of erosion erases rock record from 270 Million to 200 Million years; no rocks remain from these ages in the Pagosa area	*Amphibians rule the world- giant newts and salamanders dominate wetland and river ecologies*
260 Million			*Supercontinent comes together*	*Massive climate changes as land masses combine and mountains rise*
265 Million				*Sequoia forests spread across Earth's temperate climate zones* *First mammals*
270 Million	2000 ft	Cutler Formation *Upper Piedra River canyon*	Mountains rise to the northeast	*First conifer trees* Swamps, floodplains
275 Million			Large river systems cross Pagosa area	Beaches and lagoons along old shoreline
PERMIAN	300 ft	Rico Formation	Shallow sea fills with sediment	Shallow sea floor and tidal flats



GEOLOGIC TIME YEARS AGO *ERA/PERIOD*	ROCK FORMATIONS THICKNESS / NAME *PROFILE* / *LOCATION*	GEOLOGIC EVENTS PAGOSA COUNTRY *WORLDWIDE*	LANDFORM & ECOLOGY PAGOSA COUNTRY *WORLDWIDE*
280 Million *PENNSYLVANIAN* **285 Million**	2400 ft  Hermosa Formation *Upper Piedra River canyon*	Uplift and draining of sea; slow filling of basins by river and delta sediments	Swamps, shoreline beach dunes and lagoons *Amphibians are the dominant life form on land*
290 Million **295 Million**	150 ft Molas Formation	Subsidence; flooding of ancient land surface; oldest rocks found in Pagosa area Long period of erosion erases rock record from Precambrian to 300 Million years ago; no rocks remain from these ages in the Pagosa area	Sea floor; shallow marine sea life
300 Million *PENNSYLVANIAN* *began 325 million years ago*		Rocks exposed in deep canyons near the Continental Divide date from the Precambrian, between 1.3 Billion and 2 Billion years ago	*First flying insects* *Early mammal-like reptiles (pelycosauria)* *First reptiles (cotylosauria)*

The remaining vast divisions of geologic time stretch back through the *MISSISSIPPIAN, DEVONIAN, SILURIAN, ORDOVICIAN, CAMBRIAN,* and *PRECAMBRIAN*, back to 4.6 billion years, the current scientifically accepted age of the Earth. This chart only covers the most recent 300 million years. It would take 13 more charts of this length to cover the time from here back to the beginnings of our home planet.

The Pagosa area began as part of a volcanic island chain in a vanished ocean over 2 billion years ago. About 1.8 billion years ago, along with the rest of the land now called Southwest Colorado, the Pagosa Islands were swept up by the early North American continent as it was carried along on its tectonic plate, and became part of the ancient West Coast. The evidence of this slow but titanic collision is the Vallecito Conglomerate north of Bayfield and Durango, the remains of a pebble beach very much like those along today's Northwest Coast. Its ripple-marked sands and layers of surf-polished pebbles were trapped and compressed into rock between the Islands and the approaching continent.

Over time, other islands and landmasses were plastered onto North America, and now Pagosa Country is far from the ocean where it began. The land we know today is the product of merely the last 300 million years of geologic and climatic activity. The rocks that once recorded Pagosa's early history have been blown into dust by gigantic volcanoes, ground up by glaciers, eroded away by rain and flood, and washed down into New Mexico's San Juan Basin, buried there to one day become new rock and start the geologic cycle all over again.