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# Geology of Edness K. Wilkins State Park


## INTRODUCTION

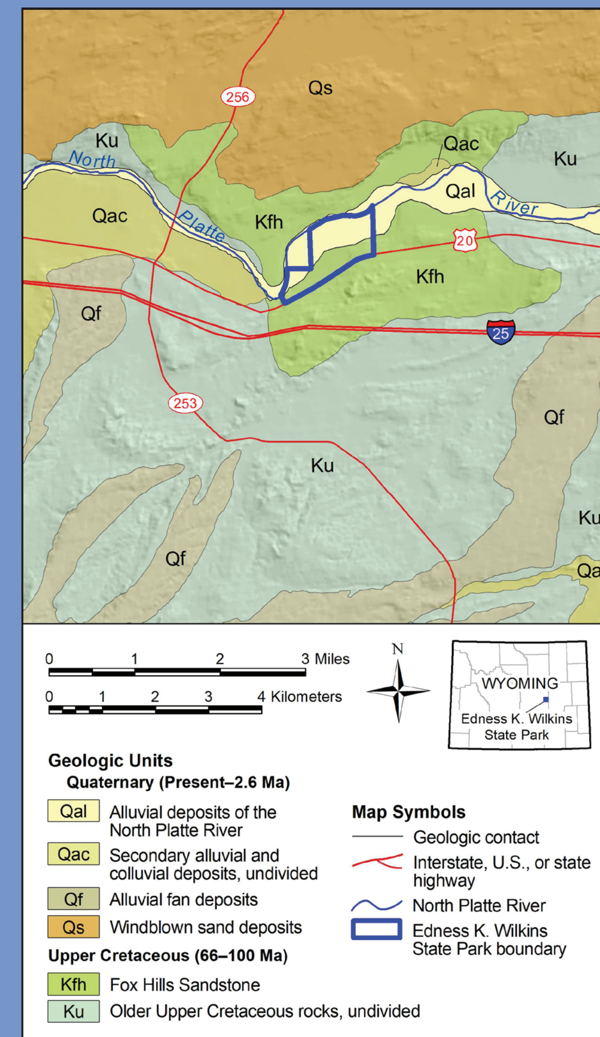
Edness K. Wilkins State Park sits in the midst of a landscape shaped by dramatic changes over the last 100 million years. Many geologic processes have made their mark on this park, including the rise and fall of an ancient inland sea, the uplift of a mountain range, and the transport of sediment by the North Platte River.

## GEOLOGIC SETTING

The bedrock exposed in Edness K. Wilkins State Park records one of the many fascinating episodes in Wyoming's geologic history—the existence and retreat of a vast body of water known as the Western Interior Seaway. The seaway covered the central part of the North American continent during the Cretaceous Period, a time before the Rocky Mountains had risen, when the earth's climate was much warmer and sea level was much higher than today. At its maximum extent around 93 million years ago, the seaway stretched from the present-day Arctic Ocean to the Gulf of Mexico.

Evidence for the seaway is preserved in the Fox Hills Sandstone exposed in the park. This rock unit consists of gray to yellow-brown sandstone interspersed with layers of shale containing marine fossils. It underlies the grassy flats paralleling U.S. Highway 20/26 and can be seen in outcrops north of the North Platte River.

The sediment composing the Fox Hills Sandstone generally coarsens upward, meaning the lower (and thus older) part of the unit contains more fine-grained material (shale) while the upper (younger) part of the unit contains more coarse-grained material (sandstone). Geologists use this evidence to infer that this layer records a regression—or retreat—of the seaway and a transition through time from a calm, shallow sea to a more turbulent shoreline setting. Older Cretaceous rocks exposed in the region record different stages of the seaway's various landward advances and seaward retreats, but it is the Fox Hills Sandstone that represents the last regression of the Western Interior Seaway to the east as it exited Wyoming for the final time.




*Simplified geologic map of Edness K. Wilkins State Park and its surroundings. Geologic unit ages are in millions of years (Ma).*

## HYDROGEOLOGY

Edness K. Wilkins State Park sits on the banks of the North Platte River nearly halfway along its 700-mile course from the Park Range in Colorado to its confluence with the South Platte River in Nebraska. The North Platte is the longest river in Wyoming and, together with its tributaries, drains around one quarter of the state's area. After flowing north out of Colorado, the river bends to the east at Casper, heading for the Great Plains.

For hundreds of thousands of years the North Platte River has cut into the surrounding sedimentary bedrock and deposited unconsolidated river sands and gravel, called alluvium. The presence of alluvium plays a key role in the history of Edness K. Wilkins State Park, as before this area was a state park it was a gravel quarry. Gravel was mined from pits within the current park boundary and used as aggregate for road base and concrete.


*View to the northeast from the state park. The river bank is composed of alluvium deposited by the North Platte River, while the distant hills expose bedrock of the Fox Hills Sandstone topped by sand dunes.*

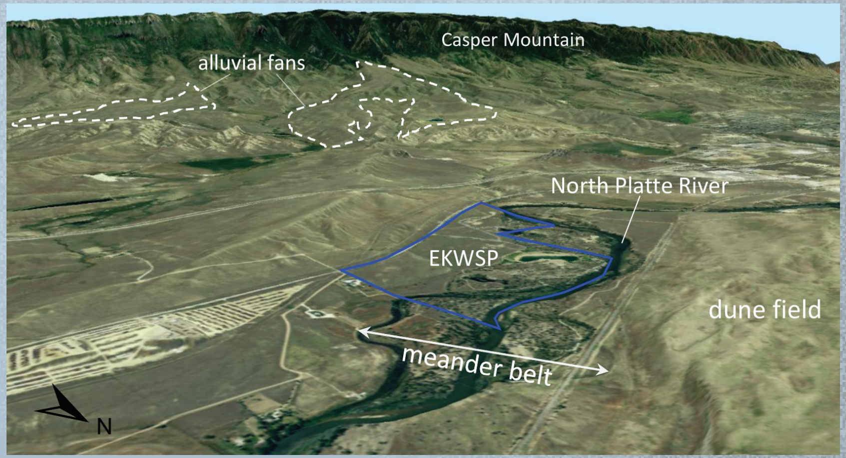
The State of Wyoming purchased the quarry in 1981 to establish a park commemorating the life of long-time Wyoming state legislator and Casper resident Edness Kimball Wilkins. Over the course of several years the site was reclaimed to a more natural state, which involved tasks such as re-contouring gravel and sand stockpiles, replacing topsoil, and seeding for regrowth of vegetation.

After quarry operations ceased, the gravel pits gradually filled with water to become the ponds you see today. Alluvium deposited by the North Platte River is highly porous, meaning a large percentage of the deposit's overall volume is taken up by void space between sediment grains. This allows for groundwater to easily pass through and exchange with the river, explaining why today there is water in the park's ponds. In fact, the water levels in these ponds track with changes in the river, such that a rise or fall in the river will cause a similar response a few days later in the ponds.

The North Platte River near the park flows within a meandering channel. The channel is constantly shifting as the river erodes its banks on the outside of bends and deposits alluvium on the inside of bends. As the river has moved back and forth through time, a meander belt, or shallow valley, has formed. Here the meander belt is half a mile wide and ~200 feet lower than the adjacent plains. The boundary between the active meander belt and older alluvial deposits (called terraces) roughly follows the southernmost extent of trees through the park. Riparian vegetation grows in the active meander belt because the soil is porous and roots can access the shallow water table.

Historically the river's flow near Casper fluctuated from less than 100 cubic feet per second (cfs) in the winter to more than 4,000 cfs in the summer from mountain snowmelt. The modern river maintains a more uniform flow regime with lower peaks and higher minimums due to large upstream reservoirs, including Alcova, Pathfinder, and Seminoe, which store water for irrigation and flood control. Even so, the North Platte can still undergo considerable flooding in wet years.

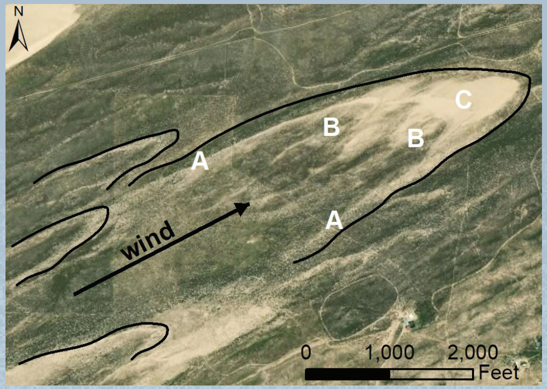
## REGIONAL LANDFORMS




*Oblique aerial view to the southwest of Casper Mountain, its flanking alluvial fans, and the valley of the North Platte River. Topography in image is 2x vertically exaggerated. Blue outline shows boundary of Edness K. Wilkins State Park (EKWSP).*

The park is favorably located for viewing geologic landforms in the area. The southern horizon is dominated by Casper Mountain, which rises 3,000 feet above the North Platte River. Casper Mountain was uplifted during a mountain-building episode known as the Laramide orogeny, which occurred about 70–35 million years ago and is responsible for the formation of the Rocky Mountains. The core of the mountain exposes metamorphic and intrusive igneous rocks that are Archean in age, or more than 2.5 billion years old. In response to compression of the earth's crust during the Laramide orogeny, these Archean basement rocks were faulted to the north, up and over the younger sedimentary rocks that now form the mountain's flanks.

Extending north from Casper Mountain are more gently sloping apron-like surfaces known as alluvial fans. These features are much younger than Casper Mountain itself, forming only in the last few million years. The alluvial fans are derived from sediment shed from the eroding mountain, which is carried down in streams and deposited where the streams emerge onto the valley floor. The sediment is thickest adjacent to the mountain front and gets progressively thinner farther north into the valley. Modern streams have cut down into the alluvial fans to form the drainages visible from the park.




*Aerial photograph of parabolic dunes 4 miles north of Edness K. Wilkins State Park. Dunes are outlined in black, and the arrow shows the prevailing wind direction. Labels: A=arms of the dune anchored by vegetation, B="blowouts," or deflation basins, where wind has removed sand, C=crest of the dune, which is unvegetated and actively migrating northeast with the winds.*

Across the North Platte River from the park is another young geologic feature formed in the last ten thousand years: a large, active sand dune field that stretches from Casper to Glenrock. The dunes are elongated in a northeast direction, reflecting the prevailing winds from the southwest. These features are classified as parabolic dunes and can be identified in map view by an extended U-shape that opens to the upwind side. The dunes are formed when vegetation anchors the two arms of the dune but cannot grow on the crest, which migrates downwind (to the northeast in this case) with time.