



Geologic Resources Inventory Fact Sheet

The Geologic Resources Inventory provides geologic map data, a written report, a map poster, and pertinent information to support resource management and science-informed decision making.

Scan QR code for access to the full report, map poster, and GIS data



<https://irma.nps.gov/DataStore/SavedSearch/Profile/2713>

Geologic Features and Processes

Badland Topography *Pages 11–12*



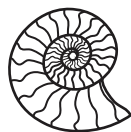
- The White River cut a narrow valley 500,000 years ago and began the erosion of the Badlands.
- The Wall is a long, narrow spine of buttes that separates the upper grasslands from the lower.
- Badland Topographical Features:
 - Castles
 - Monuments (pinnacles)
 - Sod Tables
 - Hoodoos and Caprocks
 - Yardangs
 - Natural Arches/Bridges
 - Armored Mudballs
 - Geodes

The geology in Badlands National Park spans more than 80 million years.



NPS photo

Fossil nimravid
Hoplophoneus primaevus



Paleontological Resources

The park contains some of the most species-diverse Oligocene fossil beds in the world. *Pages 12–14.*

Brule Formation

- Highly fossiliferous and diverse
- Oreodonts (extinct even-toed hoofed mammals).
- Extinct rhinoceroses, horses, and pigs
- Nimravids (false saber-cats).

Chadron Formation

- Well known for its Titanotheres, an extinct family of massive herbivores that looked like rhinos, but were more closely related to horses.

Fox Hills Formation

- Late Cretaceous marine fossils.
- Shelled mollusks (mostly clams and ammonites) and arthropods.
- Rare bones, teeth, and scales of fish and swimming reptiles.

Pierre Shale

- Late Cretaceous marine fossils.
- Giant clams and various ammonite species.

Stratigraphic Features *Pages 14–16*

Disturbed Zone of Soft Sediment Deformation

- A regional zone of intense soft sediment deformation.

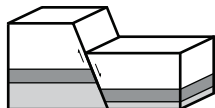
Paleosols

- Ancient soil profiles; e.g. The Yellow Mounds.

Other stratigraphic features present:

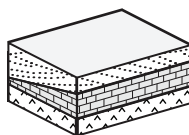
- Limestone concretions; ironstone concretions; Rockyford Ash; gravel deposits.

Structural Features *Pages 16–17*



Features in the park include:

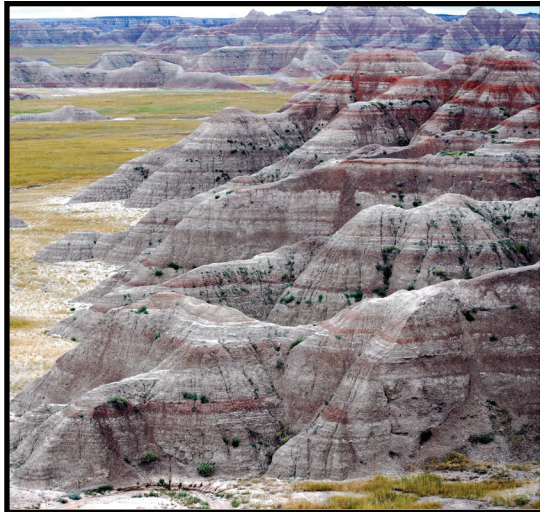
- Folds and faults
- Unconformities
- Clastic dikes





Norbeck Pass

NPS Photo



Mass Wasting Hazards Page 7



- Some of the highest known rates of erosion occur in the Badlands.
- Ridges and pinnacles can collapse overnight after a single storm.
- Landslides have been mapped in the Cedar Pass area, at Norbeck Pass, Sage Creek, and along the Cliff Shelf Trail.
- The Brule Formation and Pierre Shale are most prone to landslides.
- The Badlands Loop Road is built on several active landslides within the Brule Formation.
- Landslide deposits in Badlands National Park may be fault related.
- Swelling clays derived from volcanic ash swell when wet and contract when dry, forming a “popcorn-like surface.”

Geohydrology Issues Pages 8–9



- With increased visitation, water supply and water quality continue to be important issues.
- Concerns exist over contaminated surface and ground water from extensive herbicide use.

Paleontological Resources Pages 7–8

Illegal Fossil Collection

- Fossil poaching has been and remains a serious issue.
- Illegal diggings have been discovered at the Titanotherium Bone Bed.
- The Big Pig Dig site lies adjacent to a gravel road, so protective fencing and storage have been installed.
- Illegal fossil collection by park visitors is likely to occur close to roads and trails.
- Illegal fossil collection by amateur and commercial collectors is likely to occur at more remote sites with larger quantities of theft.

Geologic History

The following is a brief history of the geologic events that formed the present landscape. Pages 25–28.

Late Cretaceous Period (80 million to 66 million years ago)

- The Pierre Shale is deposited in the Western Interior Seaway.
- The seaway alternates between shallow seas abundant with marine fauna and deeper, stagnant seas with little life.

Tertiary Period (Paleogene and Neogene Periods) (66 million to 2.6 million years ago)

- During the early Tertiary, the Badlands region is still near sea level.
- The Laramide Orogeny continues to raise the Black Hills.
- During the Eocene and Oligocene, streams and floodplains deposit sediments, sands, and gravels draining from the uplifted Black Hills.
- During the late Oligocene (28 to 26 million year ago), the region becomes much drier and is episodically blanketed by voluminous ash-fall deposits.

Quaternary Period (2.6 million years ago to present)

- The continental glaciations of the Pleistocene directly alter the flow direction of the Missouri River, increasing erosional rates.
- The Cheyenne, White, and Bad Rivers (and their tributaries) gradually carve into the plateau that contains the Badlands.

NPS photo by Ed Welsh



The Fox Hills Formation represents a nearshore environment that existed when an ancient sea retreated from South Dakota.