



## Geology



This pothole, worn into the Dakota Sandstone on the canyon rim, was formed by a combination of water and wind erosion. Potholes collect and hold water thus providing a unique microenvironment for communities of algae, mosses, fairy shrimp, and insects.

## History

Hovenweep National Monument is located on Cajon Mesa in the northwest quadrant of the San Juan River Basin. Mesa means “table” in Spanish and generally implies a highland that is fairly flat on top. Cajon Mesa is tilted to the southwest starting at 6,800 feet near Cutthroat Castle and ending up at 4,950 feet southwest of Cajon ruin.

Despite the many deep and revealing canyons on Cajon Mesa, only two geologic formations are easily visible at Hovenweep. The earlier of these to be deposited was the Burro Canyon Formation laid down between 100 and 136 million years ago in the early Cretaceous period by a river and floodplain complex containing occasional small brackish ponds. It is composed of white conglomerate, green shale, mudrock, and sandstone layers with interspersed pebbles and cobbles of chert, silicified limestone, and quartzite. The Burro Canyon Conglomerate is easily seen at Cutthroat Castle and along the canyon crossing section of the Little Ruin Canyon trail. This conglomerate was an important source of material for tool production during ancestral Puebloan times. Also look for the green shale that can be seen along the upper portion of the Holly Trail.



Burro Canyon Conglomerate along the Little Ruin Canyon Trail.

After the Burro Canyon Formation was deposited there was a fairly long period of erosion lasting almost until the end of mid-Cretaceous times. In geology this is known as an “unconformity” because one or more layers of rock are missing from the geologic record - usually due to erosion.

Deposited during late Cretaceous times (30-70 million years ago) and representing a transition from river to swamp to marginal marine conditions, porous Dakota Sandstone is the caprock on Cajon Mesa and the other layer visible from within the monument. It comprises the open slickrock on the canyon rims and was utilized as a building material and for manos and metates, implements used to grind corn in ancestral Puebloan times. In addition to this yellow/gray sandstone, the Dakota Formation is composed of mudstones and a few thin beds of coal. Look for coal deposits along the trail to Twin Towers and in the canyon crossing.

Together, these two geologic strata are responsible for the canyonhead seeps that were so important to Hovenweep settlement patterns. Seeps occur where the porous Dakota sandstone meets the relatively

impermeable Burro Canyon shale. Water percolates slowly down through the Dakota Sandstone and is channeled horizontally along the top of the Burro Canyon Shale to the nearest available surface opening. When the seep appears in a canyon wall, as is the case with all of Hovenweep's seeps, they often form small caves or alcoves.

While only two geologic strata are easily visible within the monument, the landscape features that make up the horizon have an interesting geologic story. During the Miocene epoch, 10-25 million years ago, masses of molten trachyte (fine-grained, light colored, igneous rock) intruded all the way up into the Mancos Shale (a layer of rock which lies atop the Dakota sandstone and has since been eroded away in this area). This molten magma never reached the surface and hence cooled slowly forming a mounded bed of crystalline igneous rocks. In the Pliocene epoch the overlying Cretaceous and Tertiary beds of rock were eroded away exposing what are now known as Sleeping Ute Mountain to the east and the Abajo Mountains to the west. In geologic terms these formations are known as "laccoliths."

Sediments deposited on Cajon Mesa continued to erode through the late Pleistocene up to early Recent times (6-10 thousand years ago). It was around this time that early people, the Archaic, wandered this area in search of game. They utilized caves and overhangs for shelter, and shaped metamorphic and igneous rocks to make points and hammers. By 700 CE (Common Era) the bow and arrow was being utilized to more effectively hunt smaller game as the people in this region settled into a more agricultural lifestyle. The majority of the reddish-brown loess soils that are predominant in this area are from the fine grained soils of Monument Valley and the lower reaches of the San Juan River. They were deposited here by south-southwesterly winds in recent times (10,000 years ago to present). This soil allowed the ancestral Puebloans to grow crops of corn, beans, and squash for hundreds of years. Mostly composed of fine-grained sandstone with a reddish coating of iron oxide, this soil supported what was once a densely populated area. Today it still provides fertile cropland for alfalfa, bean, wheat and safflower farmers in nearby Montezuma Valley communities.

---

### **Protect the past for the future**

We need your help to preserve Hovenweep National Monument. There are several things you can do to preserve and protect Hovenweep for future generations:

- Stay on designated trails and away from fallen walls and mounds of stone. Walking on or near walls and structures weakens them, accelerating their deterioration.
- Areas behind chain barriers are closed to protect fragile sites. Do not cross these barriers.
- Look but do not touch. The oils from your hands permanently stain rock surfaces.

- Take photographs; do not take artifacts. Any person who excavates, removes, damages, alters, or defaces any archeological resource on federal lands is subject to arrest and felony prosecution as dictated by the Archeological Resources Protection Act of 1979.
- Eat at designated picnic tables. Do not eat or leave trash at archaeological sites. Food attracts rodents that will burrow and build nests in fragile structures.
- Pets are allowed on trails but must be on a six foot leash at all times.

---

### **Protect Yourself**

- Bring enough water for yourself and your pets.
- Wear sunscreen and hat; rest often.
- Respect the wildlife. Venomous insects and snakes live in the Southwest.
- Do not eat plants. Some may be poisonous.