



Karst Resource Management

Antietam National Battlefield, located in the Valley and Ride Province of Maryland, is underlain by Cambrian and Ordovician (550 mya) carbonate rocks. This predominately limestone lithology is weathered easily by solution, which produces karst features. These features are formed by the dissolution of Calcium Carbonate (CaCO₃). The CaCO₃ is dissolved over time by carbonic acid from rainwater percolating through the above soil down to the bedrock. Fractures and bedding planes in the bedrock eventually become enlarged to create voids. Voids big enough for human occupancy are called caves. Some underground voids cause the overlying ground to collapse, forming a sinkhole. Karst springs occur where underground voids with water meet the surface. Karst outcrops allow pollution to enter the bedrock between joints and bedding planes.

The accessibility between the surface and underground makes maintaining proper water quality in karst a challenge. Antietam has several karst features, all which must be monitored by the Natural Resource division to protect water entering and leaving the karst aquifer. Present threats are mostly agricultural runoff and tanker spills on Highway 65. But threats still exist from the past, since chemicals leached from previously farmed land can remain in the shallow ground water for decades (Greene 2007).



Rock Outcrops

The most common rock in ANB is Limestone. Outcrops throughout the Park form parallel ridges called pinnacles. These ridges are made of beds that were horizontal before becoming tilted and bent during the Appalachian Orogeny. These beds have an average strike of N38E and steep dips where the beds are close to vertical.

Right: Close up of dissolution weathering surfaces in limestone on Joseph Poffenberger Farm.

Background: Limestone outcrops in field on Piper Farm.



Caves

Few caves inside the park boundary are large enough for human entrance; most are habitats for small mammals like raccoons and groundhogs. Since cave openings are direct recharge points into the underground, caution must be exercised in cave entrance protection to prevent groundwater pollution.



Above: Small mammal den in rock outcrop along Snavelly Ford Trail.
Left: Cave on Joseph Poffenberger Farm.



Sinkholes

Sinkholes are formed when a cavity under the surface collapses, causing the ground to sink. Like cave openings, these karst features are direct conduits to groundwater. They need water quality protection by establishing buffer zones around the sinkholes for protection against agricultural runoff. Sinkholes should also be fenced off to keep livestock out.



Above: Trash in sinkhole near the Observation Tower.
Left: Sinkhole in a cow field on Joseph Poffenberger Farm, wooded but not fenced off from livestock.



Karst Springs

ANB Natural Resources has identified 10 karst springs in the Park. Two are currently included in the monthly water quality testing sites. These sites are tested for pH, temperature, ORP, conductivity, dissolved oxygen, Nitrate-Nitrogen, and Orthophosphates. Springs are important habitat for many aquatic species of macro and microinvertebrates, such as the newts and Crayfish below. To keep pollution from harming aquatic life, spring recharge areas should be delineated and then protected from point and non-point source pollution.



Karst Soil

Three major soil series make up the shallow karst soils in the Park: Hagerstown, Duffield, and Ryder. These soils are well drained and mostly silt loams (more than 50% silt and some clay), mesic (moist), and from the Great Group Hapludalfs (Suborder Udalfs, Order Alfisols (mineral soils low in organic matter but can maintain crops)). Slopes range from 0 to 25 percent, and soil depth varies from exposed bedrock (no soil cover) to 99 inches (WA Co. Soil Map 2001).

Below: Example of karst soil above limestone bedrock.



Clockwise from left: Haines Spring, one of the monthly water quality monitoring sites at ANB; Salamander found in Mumma Spring; Type of macroinvertebrate found in all four dug wells; Isopods baited with shrimp from Roulette Spring House; Crayfish and newts in Mumma Spring.