

Groundwater

Picture of the Month



Picture of the month prepared by Andrew Stone, Hydrogeologist
andrewstonewater@gmail.com



Ash Meadows, Nevada — A Unique Oasis in the Desert

Complex hydrogeology. Flow system with discharge at Death Valley. Endangered pupfish dependent on springflow. Threatened habitat. Water quality threats from development, nuclear test site and lithium mining.

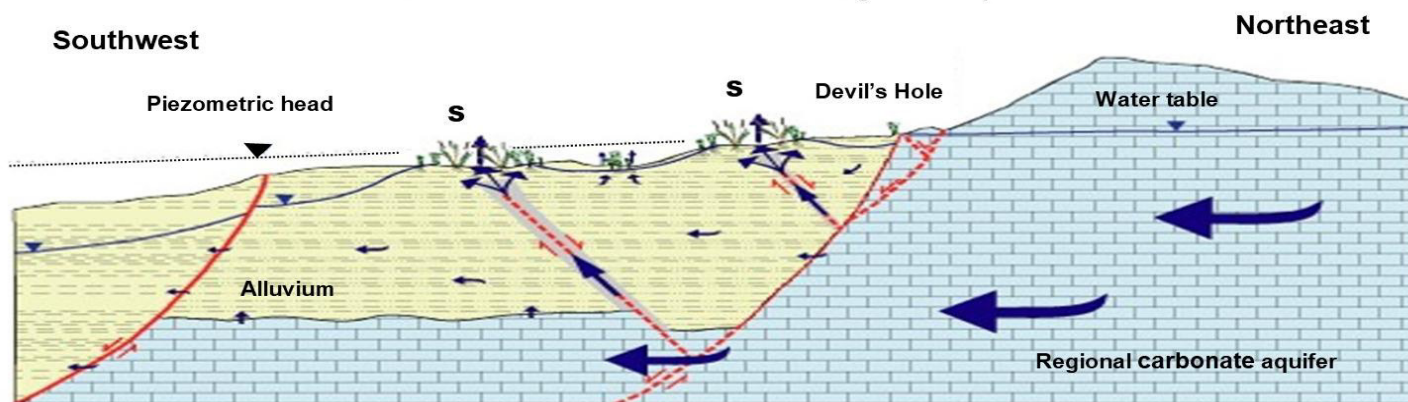
Ash Meadows is an area in the Amargosa Desert in southwest Nevada with an ecosystem sustained by groundwater. Often described as an oasis in the desert, springs at Ash Meadows are outflows from subsurface water “plumbing” which are part of the Death Valley Regional Flow System. Geologically, Ash Meadows is in the tectonic Basin & Range system of the western US. Earth movements stretching the Earth’s crust in the early Cenozoic Era (60 million years ago) resulted in geological faults producing a series of grabens (basins) and horsts (ranges) between eastern Utah and California.



Ash Meadows Amargosa Pupfish (photo: Nevada Department of Wildlife)

The groundwater that emerges at Ash Meadows originates as snowmelt from Spring Mountains to the east. At Ash Meadows there are 30 separate springs and seeps with a combined flow of about 10,000 gallons per minute. Groundwater flowing in a southwesterly direction in limestone and dolomite carbonate rocks reaches the surface because of geological fault systems that act as both conduits and barriers to flow. The geological cross section below (modified from US Geological Survey Report, 994079) shows a simplified concept of the springs’ “plumbing system.” The springs were once part of a much larger system of lakes and streams that started to dry up about eleven thousand years ago when the regional climate changed, isolating the fish population.

Schematic of Ash Meadows Groundwater Flow Modified from USGS Water-Resources Investigations Report 99-4079



Faults in red. Arrow shows displacement direction
Dashed red lines indicated conduit zones

Blue arrows show groundwater flow direction
S—springs

The endemic Ash Meadows Amargosa Pupfish is found only in the spring-fed streams and pools in the Ash Meadows National Wildlife Refuge. The spring systems are of great ecological significance. The springs include the Devil's Hole, declared a National Monument in 1952. The Devils Hole Pupfish (*Cyprinodon diabolis*) is a one inch long critically endangered species that only lives in the upper part of the 400 foot deep Devils Hole cavern. The spring system has been threatened by agricultural development by settlers in the 19th and 20th centuries, irrigation pumping in the 1970s, proposed housing development in the 1980s and more recently, plans for an open pit lithium mine on the margins of the Ash Meadows National Wildlife Refuge. In addition to potential hydrological impacts from climate change, there is a possible future groundwater contamination risk from the upgradient nuclear test site 50 miles away.

More Information

For more information and links to videos and websites about the interesting Ash Meadows hydrogeological/ecological system and the politics of threats and protection, just put keywords Ash Meadows Springs or Devils Hole Pupfish into your browser. [USGS report 99-4079](#) is a good source for hydrogeological information.