



Site Description

Amargosa Desert

(updated 2010)

Geologic setting: The Amargosa Desert covers 6700 square kilometers along the California-Nevada border northeast of Death Valley National Park. The desert extends roughly 90 km NW-SE between the Bare Mountains (north) and Spring Mountains (south). The valley floor is covered with 100+ meters of alluvium, underlain by Cambrian-to-Devonian era carbonate strata. Minor quartzite and argillite are interbedded with the limestone and dolomite basement. The northeastern desert, near Yucca Mountain, is marked by Tertiary-to-Quaternary tuffaceous outcrops (Walker and Eakin, 1963).

Ash Meadows, in southernmost Amargosa Desert, has perennial spring flow. The meadows sit down-gradient of the Amargosa carbonate aquifer, which discharges ~17,000 acre-feet per annum (Walker and Eakin, 1963). Ash Meadows springs are related to one or more north- and northwest-trending faults along the eastern basin (Naff, 1973).

Geothermal features: Warm springs and wells are concentrated within southeastern Amargosa Desert, near Ash Meadows and Death Valley National Monument (SW¹/₄ NE¹/₄ Sec 19, T18S, R51E). The Great Basin Groundwater Geochemical Database (Penfield et al., 2011), a geochemistry repository hosted by the Nevada Bureau of Mines and Geology, identifies 19 thermal wells and 36 thermal springs within Ash Meadows. The temperatures range from 21 to 34.6°C, with geothermometer values of $57.4 \pm 13.2^{\circ}\text{C}$ (Ca-Na-K; Fournier, 1981) and $43.1 \pm 15.0^{\circ}\text{C}$ (chalcedony; Fournier, 1981). Many wells are no more than 5 to 8°C above the mean annual air temperature.

An additional 77 thermal wells have been identified within the greater Amargosa Desert (Penfield et al., 2011). Similar to Ash Meadows, these temperatures are 21 to 46°C, with geothermometer values slightly above measured temperatures: $63.1 \pm 16.8^{\circ}\text{C}$ (Ca-Na-K; Fournier, 1981) and $63.3 \pm 29.8^{\circ}\text{C}$ (chalcedony; Fournier, 1981). The hottest wells locate along the NNE desert margin, at Amargosa Valley (town) and the Beatty Airfield.

Four thermal gradient holes have been drilled in central Amargosa Desert, near Amargosa Valley (town). The hottest gradient holes are SSW of Amargosa Valley, the trend cooling with distance: gradients measure 91.9°C/km (8 km SW), 66.5°C/km (13 km S), and 40°C/km (16 km SW). The hole 8 km east of Amargosa Valley is 31.1°C/km (Blackwell and Richards, 2010).



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Big Spring, Ash Meadow Spring, Deep Spring, etc: Springs at Ash Meadows range from 21 to 34.6°C, with discharge of 3785-6711 L/min (Hughes, 1966; Mifflin, 1968; Center for Water Resources Research, 1973). Secondary permeability controls groundwater movement through extensive Ash Meadows travertine deposits (Naff, 1973), via fractures and dissolution. Diving expeditions report 40-m-deep conduits at Devils Hole and 100-m lateral passages (Walker and Eakin, 1963). The water is sourced from Paleozoic-era carbonates, which outcrop northeast of the springs (Dudley and Larson, 1976).

The endangered Amargosa pupfish occurred in 10 Amargosa Desert spring systems historically. The springs have been designated Critical Habitat within the Ash Meadows National Wildlife Refuge (U.S. Fish and Wildlife Service, 2010).

Leasing information: None available.

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