



## Site Description

### Warm Springs Valley

(updated 2010)

#### Geologic setting:

Geothermal features: Three areas of geothermal activity are known in Warm Springs Valley, labeled here Northwest, Central, and South Warm Springs Valley. The northwestern valley contains the area's namesake warm springs (Secs. 22,23, T23N, R20E), surrounded by ~11 km<sup>2</sup> of thermal groundwater. This thermal area, plus Fraser Flat (central valley), and Curnow Canyon (south valley) all situate along the western boundary of Warm Springs Valley (Tingley and others, 1999). One or more northwest-striking faults form the valley-mountain range boundary here, and geothermal areas are almost certainly related to that fault or system of faults.

### Northwest Warm Springs Valley

Anomalous groundwater temperatures are known in several sections near the warm springs (Secs. 22, 23, 25, 26, and 35, T23N, R20E). The temperatures appear to be hottest (68°C) at the Marshall Geothermal Well, and decrease with distance (unpub. well driller's reports in the Office of the Nevada State Engineer). The approximately 11 km<sup>2</sup> geothermal area is apparently elongate in a northwest-southeast direction, parallel to a possible basin-bounding fault. The hotter temperatures at the west edge of this area suggest that the cooler temperatures east and south result from mixing of geothermal water, which rises along the fault, with shallower cool groundwater in the basin-fill deposits. Well depths range from 47 to 188 m.

**Warm Springs:** A "warm spring" (13.9°C) was sampled among the three namesake warm springs of Warm Springs Valley. By October 2007, water levels were very low: even at 60 cm depth, the sampling tube refilled with opaque, sulfurous mud. Location coordinates are 39.8469 N, 119.72048 W (NAD83). The second spring was temperature-tested at 12°C. The water ponded over a thicket of dormant cattails and brush. The third spring is most likely dry. Low geothermometers throughout the valley discourage a second sampling visit.

**Marshall Geothermal Well:** The Marshall Geothermal Well, located east of Winnemucca Road at Dogskin Mountain, sprays an evaporation pond with 68°C water. The pond had mud and small puddles in October 2007, indicating recent outflow, but could not be sampled.



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A 100m warm well (31.1°C) was sampled 3 km south of Marshall Geothermal Well. The landowner directed UNR samplers to the warmest outdoor pump of five. This site is situated within the Warm Springs Mountain outflow zone; lateral flow is thought to cool the well signal. Geothermometer values are divergent, at 90.3°C (Na-K-Ca-Mg) and 37.1°C (chalcedony). Location coordinates are 39.8243 N, 119.71274 W (NAD83). The landowner reported a 47°C well at the Ralston property 100-m north, but no one was available.

The nearby Bator property, with its multiple huts, was originally developed for alligator farming. Anthony Bator permitted a 188-m geothermal well for the Bator's Gators project in 1989, but secondary approval was never granted for aquaculture [<http://www.newsreview.com/reno/content?oid=19649>].

### Central Warm Springs Valley

**USBLM Stables Well:** A more restricted area of thermal groundwater (~1 km<sup>2</sup>) is found south of State Route 445, near the USBLM Stables (Sec. 7, T22N, R21E). Three wells there have reported water temperatures of 43°, 43°, and 29°C (unpub. well driller's reports in the Office of the Nevada State Engineer). A range-bounding fault may pass through this area.

In June 2008, UNR staff sampled a hot, sulfurous well at the BLM Wildhorse Adoption Center. 46.0°C water flowed directly from the spigot into an evaporation pond 10' north. Location coordinates are 39.79607 N, 119.66782 W (NAD83). Geothermometer values are moderate, at 91.5°C (Na-K-Ca-Mg) and 84.5°C (chalcedony).

Coyote Spring (14.6°C) was sampled one mile southwest of the BLM Wildhorse Adoption Center in the basaltic Pah Rah Range foothills. Algae grows throughout the 15 x 10m pond and inflow pipe. Location coordinates are 39.78304 N, 119.67855 W (NAD83). Geothermometer values are low, at 74.3°C (Na-K-Ca-Mg) and 53.3°C (chalcedony).

**Barbato Ranch:** A 200m warm well (21.1°C) is piped laterally 1/4 mile into a man-made lake at 30 L/min. The lake is roughly 25 x 50m wide with algae, tall reeds, ducks, and bullfrogs. Gary Barbato, a local hydrologist, provided additional information about the well testing, drawdown, sediment layering, etc. Location coordinates are 39.78277 N, 119.60749 W (NAD83). Geothermometer values are moderate, at 67.6°C (Na-K-Ca-Mg) and 92.7°C (chalcedony).



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**Claypool Ranch:** UNR technicians sampled a 156m-deep irrigation well (17.4°C) on the Claypool ranch, near Fraser Flat. According to the owner, well temperatures and water quality are similar to three other wells on the ranch. The water is clear, with a slight H<sub>2</sub>S smell. Location coordinates are 39.81492 N, 119.64775 W (NAD83). Geothermometer values are low, at 49.8°C (Na-K-Ca-Mg) and 77.3°C (chalcedony).

### South Warm Springs Valley

**Curnow Canyon:** Near the mouth of Curnow Canyon, about 8 km south of the Wild Horse Facility, another area of warm water wells is observed. Two driller's logs reported warm water from 225-m- and 107-m-deep wells, and another reported 60°C in a 188-m-deep well. By May 2008, the area surrounding Curnow Spring and Curnow Well had been developed, and neither site has surface expressions of water.

### Virginia Mountains

#### *Cottonwood Spring:*

Leasing information: