the north end of Lake Valley, along the toe of the alluvial fan from the Schell Creek Range. Reported temperatures range from 65° to 70°F, with flow rates (one spring ?) of 50 to 1,400 gpm. The water is used for irrigation (Rush and Eakin, 1963; and Lamke and Moore, 1965).

Hammond Ranch [166]. A large hot spring issues from limestone at the head of Camp Valley (probably S17,T5N, R69E) on the Hammond Ranch. The water has a temperature of 84°F and is used for irrigation (Carpenter, 1915).

Sand Springs Valley [171]. Sand Springs in S26,T2S, R55E is the only reported hot spring in northwestern Lincoln County. It has a temperature of 86°F but a flow rate of only 0.2 gpm. The N. J. Gunderson well to the southwest in S19,T3S,R55E has a water temperature of 83°F, and two other wells in S5,8,T4S,R55E are reported to contain "warm" water (Van Denburgh and Rush, 1974).

Bennetts Springs [169]. Bennetts (Bennett) Springs in S7,T5S,R66E, have a temperature of 70°F and a flow rate of 10 gpm. There are two springs along a buried fault. The water is used to water cattle (Hardman and Miller, 1934).

LYON COUNTY

Hazen area (Patua) Hot Springs [177]

Patua Hot Springs consist of four springs and two mud domes, located in S8,13,T20N,R26E about 4 miles northwest of Hazen (Miller and others, 1953; Tischler and others, 1960). The springs are reported to be boiling. Only one published analysis is known from the springs.

In 1961 Magma Power Co. drilled three shallow cable-tool exploratory wells in the area. These were reportedly 300 to 750? feet deep, with temperatures above 275°F (Koenig, 1971; B. C. McCabe, written communication).

Wabuska Hot Springs [181]

Hot springs, approximately 1 mile north of Wabuska, range in temperature from 138° to 162°F and occur over a large area in S14,15,16,23,T15N,R25E. Gas bubbles issue from the pools with a faint odor of H_2S (Stearns and others, 1937). According to Russell (1885, p. 48, 49), the springs occur along an east-west line that coincides with the course of a post-Lahontan fault which is plainly shown by an irregular scarp, in some places 20 feet high. The springs occur in circular mounds; the water is collected in small basins and evaporated, reportedly forming a saline deposit, a section of which is described below (Russell, 1885):

1 to 2 in.	white, hard crust of sodium sulfate with sodium chloride, some calcium carbonate.
2 to 7 in.	soft, mealy or clayey deposit of sodium sulfate, calcium carbonate, calcium sulfate, etc.
6 to 8 ft.	clear, transparent crystals of sodium sulfate with some impurities; resting on saline clay.

The American Sodium Co., using evaporating ponds, refined and shipped sodium sulfate from here in the 1930's. Davis and Ashizawa (1960) have suggested that a chemical company might be able to use hot water from wells to refine sodium sulfate. Samples of mixed sodium chloride and sodium sulfate from surface incrustations reportedly show minor amounts of potash but no lithium, rubidium, cesium, nitrate, phosphate, or borate salts (Moore, 1969, p. 40).

Steam well at Wabuska Hot Springs, Lyon County.

In 1959 Magma Power Co. drilled three steam wells at the Wabuska area. Two of the wells were shallow (less than 600 ft) and the third was drilled to 2,223 ft, with a maximum reported temperature of 227°F. Several water wells in this area have temperatures above 80°F. Also, a well about 4 miles to the southeast reportedly has 70°F water. Samples of water from the Magma Power Co. wells yield estimated reservoir temperatures of 293° and 306°F based on silica and Na-K-Ca geothermometers (Mariner and others, 1974).

In 1972 Agri-Technology Corp. began building greenhouses near the site of the steam wells. The company plans to grow vegetables hydroponically, especially tomatoes, using the steam and hot water from the wells to heat the greenhouses.

Long and Brigham (1975a) and Peterson (1975) have reported on audiomagnetotelluric and gravity data in the Wabuska area.

Hinds' (Nevada) Hot Springs [184]

The third hottest springs in Lyon County, after Hazen and Wabuska, are those found near the edge of the Pine Nut Mountains along the western margin of Smith Valley. These springs are named for J. C. Hinds, the first settler in the north end of Smith Valley. Hinds utilized the springs as early as 1860 for agriculture and in a spa built on the site (Loeltz and Eakin, 1953; Thompson and West, 1881). The flow of the springs was also used to turn a water wheel, which powered a rock arrastre employed to mill various ores from mines in the vicinity (Pioneer Nevada, 1951, p. 96).

The temperatures reported at Hinds' are as high as 149°F (L. J. Garside, unpublished data), although cool sulfur water reportedly issues from a spring only a few hundred feet away. Thermal springs are also found along the edge of the valley from half a mile south of the main springs at Hinds' to a point due south of the alkali flat. Generally the flow of each spring is less than 5 gpm and the temperature is a little less than 70°F (Loeltz and Eakin, 1953). The water from these springs is probably rising from depth along a system of faults. The fluoride content of Hinds' Hot Springs has been reported as 2.7 and 3.1 ppm. Most water in Smith Valley whose temperature indicates little if any mixing with thermal water contained only 0.2 to 0.4 ppm fluoride. It appears that high contents of fluo-

ride in this area are associated with the thermal water found along the south and west sides of Smith Valley, presumably along fault planes (Loeltz and Eakin, 1953). An estimate of the reservoir temperature of Hinds' Hot Springs, using the Na-K-Ca geothermometer, is 187°F, and deposits of travertine are reported (Mariner and others, 1974).

In the early 1960's, U. S. Steel Corp. drilled three geothermal exploration wells at Hinds' Hot Springs (Appendix 1). The temperatures encountered in these wells were reportedly lower than the maximum temperatures from nearby springs. Today the water from Hinds' Hot Springs is used to irrigate pasture and other salt-tolerant grasses, and in a swimming pool near the site of two of the geothermal wells. The third geothermal well is a short distance to the south of the pool.

Hinds' Hot Springs are only one of several thermal water areas along the eastern edge of the Pine Nut Mountains. The contact between alluvium and bedrock along the mountain front is a series of faults (Moore, 1969). Recent faulting is indicated in this area by discordant breaks in slope on some alluvial fans, such as on the small fan just south of Hinds' Hot Springs (Loeltz and Eakin, 1953). The other thermal areas are the Wellington area, 10 miles to the south, and the Artesia Lake area, 2 to 4 miles north of Hinds' Hot Springs.

Wellington area [187]

At least seven water wells near the town of Wellington have encountered warm to hot water at depths of 65 to 200 feet. The wells are located in S2,11,12,T10N,R23E. The deepest well (200 feet) has a reported temperature of 117°F, and there are indications that it may become hotter with increased pumping (Loeltz and Eakin, 1953). The water chemistry of this well is very similar to Hinds' Hot Springs 10 miles to the north, suggesting a common source for the thermal water. Water from the 117°F well is used for a public swimming pool.

Artesia Lake area [183]

The Artesia Lake area is 2 to 4 miles north and northeast of Hinds' Hot Springs and is a continuation of the thermal anomalies along the Pine Nut Mountains from Wellington to Artesia Lake. Warm-water wells and springs are reported from S25,27,34,T13N,R23E and S10,T12N,R23E. Well temperatures are up to 82°F for the Ambassador well; no temperature data are available for the springs, except that they are warm (Moore, 1969, pl. 1). The Ambassador well is 540 feet deep and artesian. Measurements of uranium and radium in water from this well indicate that it may penetrate volcanic rocks at depth (Scott and Barker, 1962).

Other springs and wells

Four other hot springs are reported in Lyon County. Two of these are in southern Mason Valley along the east edge of the Singatse Range. Wilson Hot Spring (S34,T11N, R25E) was reportedly dry in 1969 (Alvin McLane, personal communication, 1973), and no information is available on the other Mason Valley hot spring in S34,T12N,R25E. Unnamed springs in the SW/4 SE/4 S4,T7N,R27E along the East Walker River in southern Lyon County are approximately 110°F and are reportedly slightly radioactive (possibly due to radon in the water). The spring is in the vicinity of several uranium occurrences (Davis, 1954). Stearns and others (1937) reported two springs and a public bathing area.

Two water wells in Dayton Valley have temperatures of 80° and 95°F. They are located in S7,T16N,R21E and S12, T16N,R22E. Also, the water flowing from the portal of the Sutro Tunnel is 81° to 83°F (Glancy and Katzer, 1975). The Sutro Tunnel was built to drain the mines of the Comstock Lode. The abnormal temperatures in this mining district are described in the Storey County section.

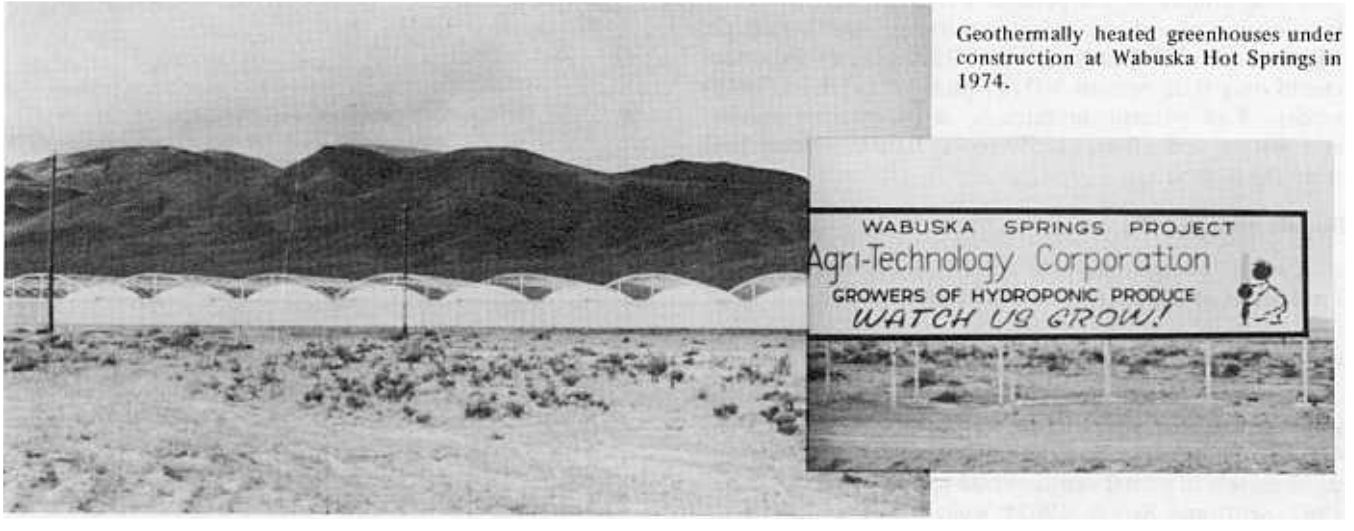
Eldorado Canyon travertine deposit [180]

A travertine terrace has been built up from hot springs, now inactive. The deposit is in the NW/4 SE/4 S36,T16N, R21E about 2.5 miles southeast of Dayton. During active mining on the Comstock Lode, the travertine was burned for lime in several stone kilns (Archbold, N. L., *in* Moore, 1969, p. 39).

MINERAL COUNTY

Wedell Springs [191]

The highest spring temperatures in Mineral County are found at Wedell Springs in the SW/4 S7,T12N,R34E. They



Geothermally heated greenhouses under construction at Wabuska Hot Springs in 1974.