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HYDROTHERMAL/GEOTHERMAL RESEARCH IN TEXAS -- STATUS OF PROGRESS[1]

C. M. Woodruff, Jr.

Bureau of Economic Geology

Hydrothermal/geothermal resources in Texas occur mainly within two structural geologic settings: (1) the Basin and Range Province of Trans-Pecos Texas and (2) the Balcones and Luling-Mexia-Talco Fault Systems marginal to the Gulf Coast Basin in Central Texas. In the Trans-Pecos region, the resource is manifested primarily by hot springs. Water temperatures in these springs are high enough (72°C) for many direct uses but are not sufficiently high for generation of electricity (Henry, 1979). Sparse population of this region also limits the usefulness of this resource. In Central Texas, the hydrothermal resource is associated with water wells; the thermal water is obtained from strata-bound sands composing the downdip reaches of normal ground-water systems (Woodruff and McBride, 1979a). Despite the modest heat value of the water (maximum water temperatures of approximately 60°C), thermal water still constitutes a viable local resource because, in many places, it is already tapped for municipal and domestic potable water. In addition, the warm-water reaches of these deep aquifers lie beneath major population areas (including the cities of Del Rio, San Antonio, Austin, Temple, Waco, Dallas, Fort Worth, and Sherman), and hence, there are numerous major facilities such as hospitals, colleges, and the like, that are potential users of the warm waters (Woodruff, 1979). The convergence of geologic and demographic attributes thus enhances the resource potential of these thermal waters (fig. 1).

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The geologic controls affecting the location of this resource are generally related to the buried Ouachita Structural Belt that separates the Texas Craton from the Gulf Coast Basin (fig. 2). The Ouachita Belt formed a strutural hinge that delineated a possible locus of initial Gulf rifting, as evidenced by the updip subcrop of Jurassic strata (Woodruff and McBride, 1979b). Periodic downwarping across the hinge has resulted in the convergence of subsequent structural and stratigraphic attributes. For example, this hinge controlled the location of the Cretaceous strand at repeated stratigraphic horizons. The change from predominantly fluvial and deltaic deposition to marine deposition is an important control that localized the downdip reaches of major aquifers along the distal parts of the terrestrial systems. Moreover, structural adjustments across this hinge have resulted in complex faulting that may have affected the location of warm-water reaches within these sand deposits.

Ongoing studies at the Bureau of Economic Geology have located other strata-bound geothermal waters in various Tertiary aquifers beneath the inner Gulf Coastal Plain and in Paleozoic aquifers that rim the Llano Uplift in Central Texas. We are now compiling: (1) an updated statewide geothermal gradient map for Texas; (2) a statewide map of deep-aquifer temperatures on the basis of new field data; (3) a statewide lineament map based on Landsat imagery; (4) presentation of hydrologic data for the Cretaceous aquifers along the Balcones and Luling-Mexia-Talco Fault Systems, and refined structural and stratigraphic interpretations for those aquifers; (5) refinement of the detailed fault and fracture configurations in Central Texas; (6) a state-of-knowledge "public" geothermal resources map for Texas; and (7) contribution of all pertinent data to the USGS GEOTHERM file.

References

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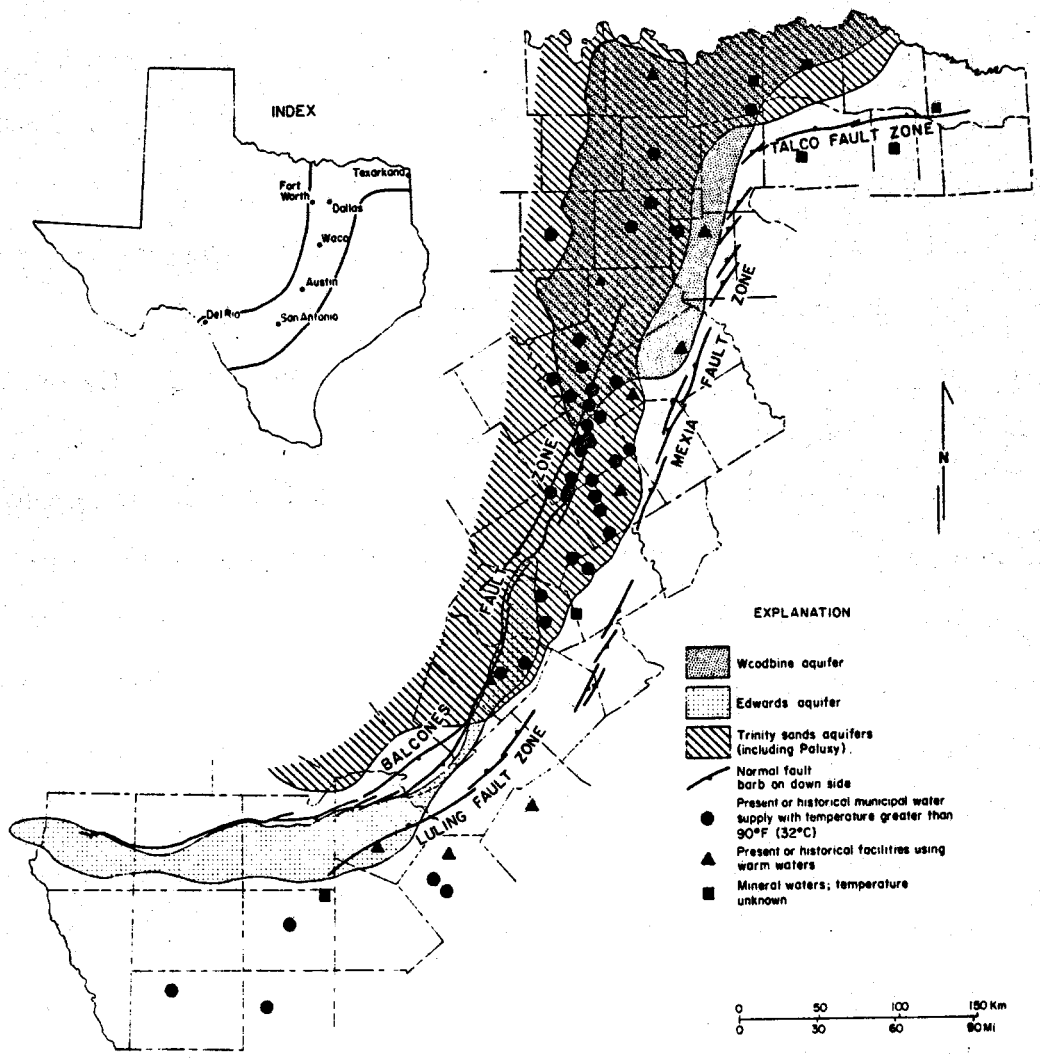

Figure 1. Selected localities within Balcones and Luling-Mexia-Talco Fault Zones, where warm waters are presently used for potable supply, or where such waters have supplied health resorts, spas, or other facilities.

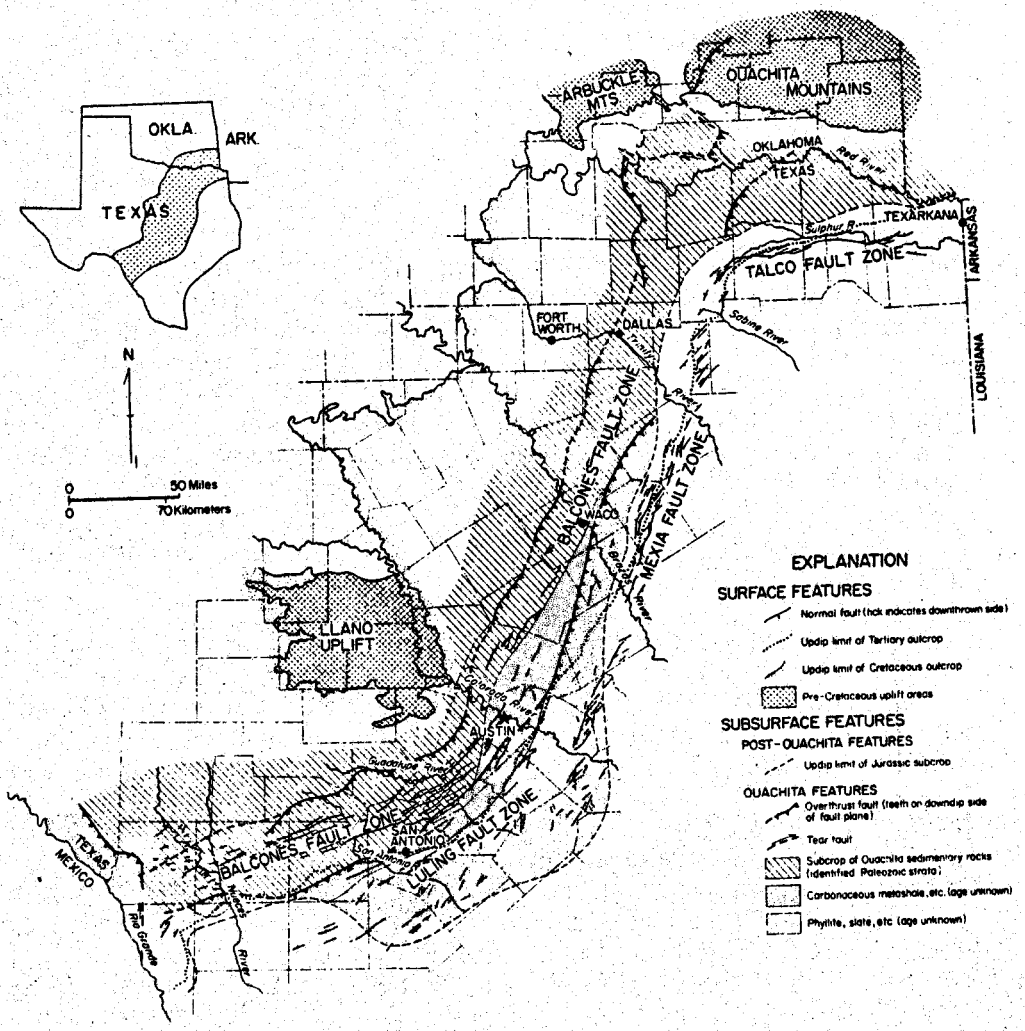

Figure 2. Central Texas geothermal province showing convergence of structural features (modified from Flawn and others, 1961, and Sellards and Hendricks, 1946).