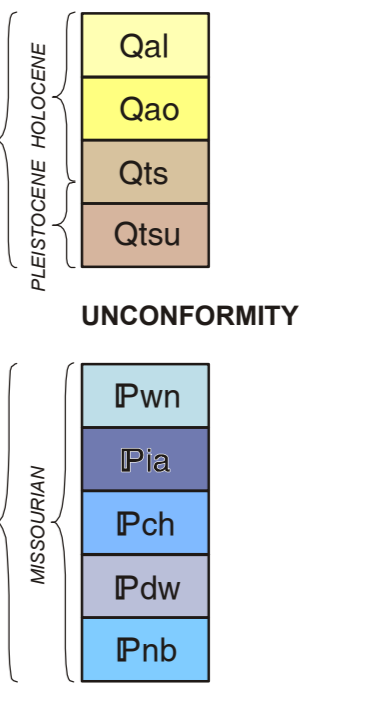
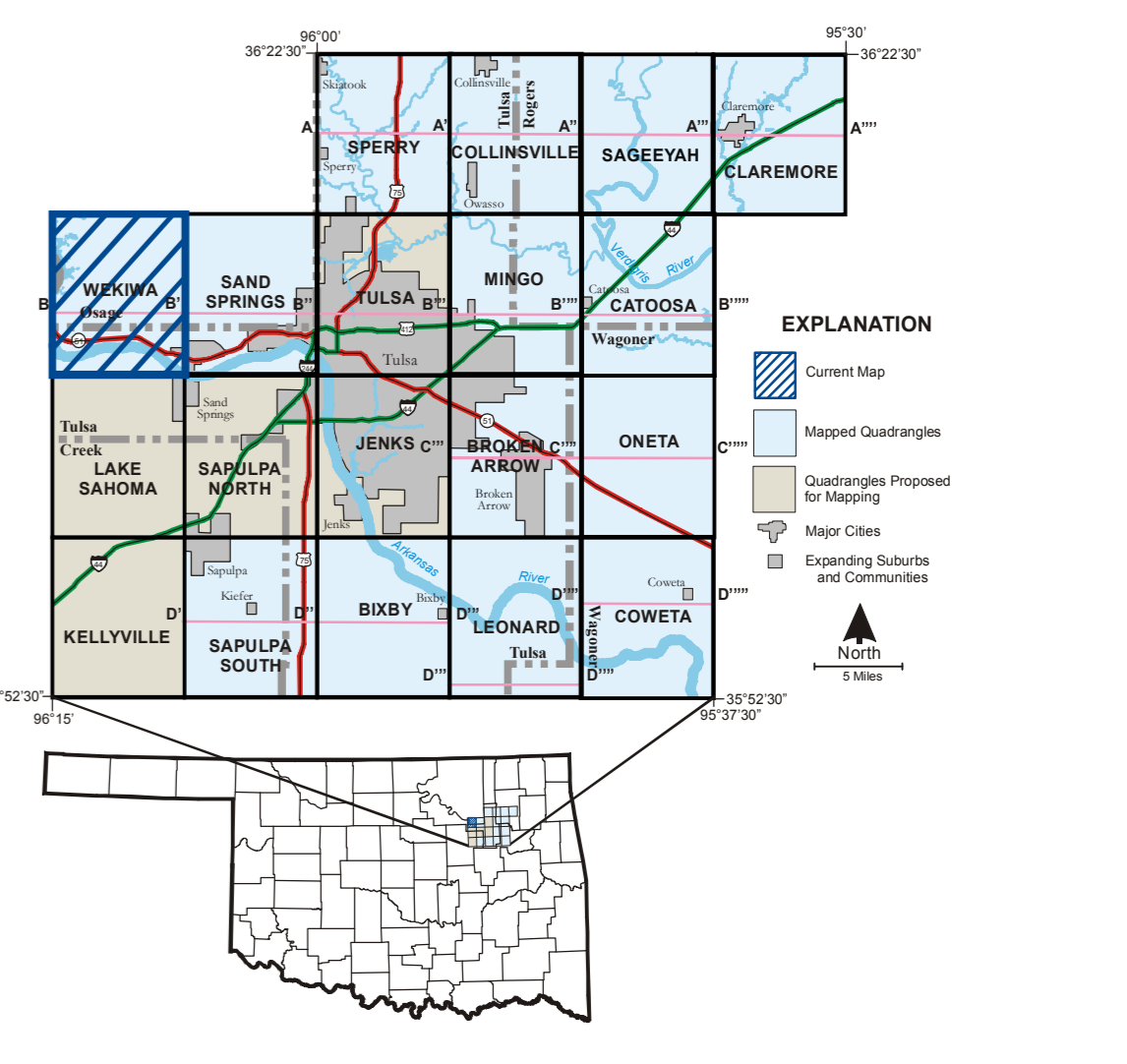
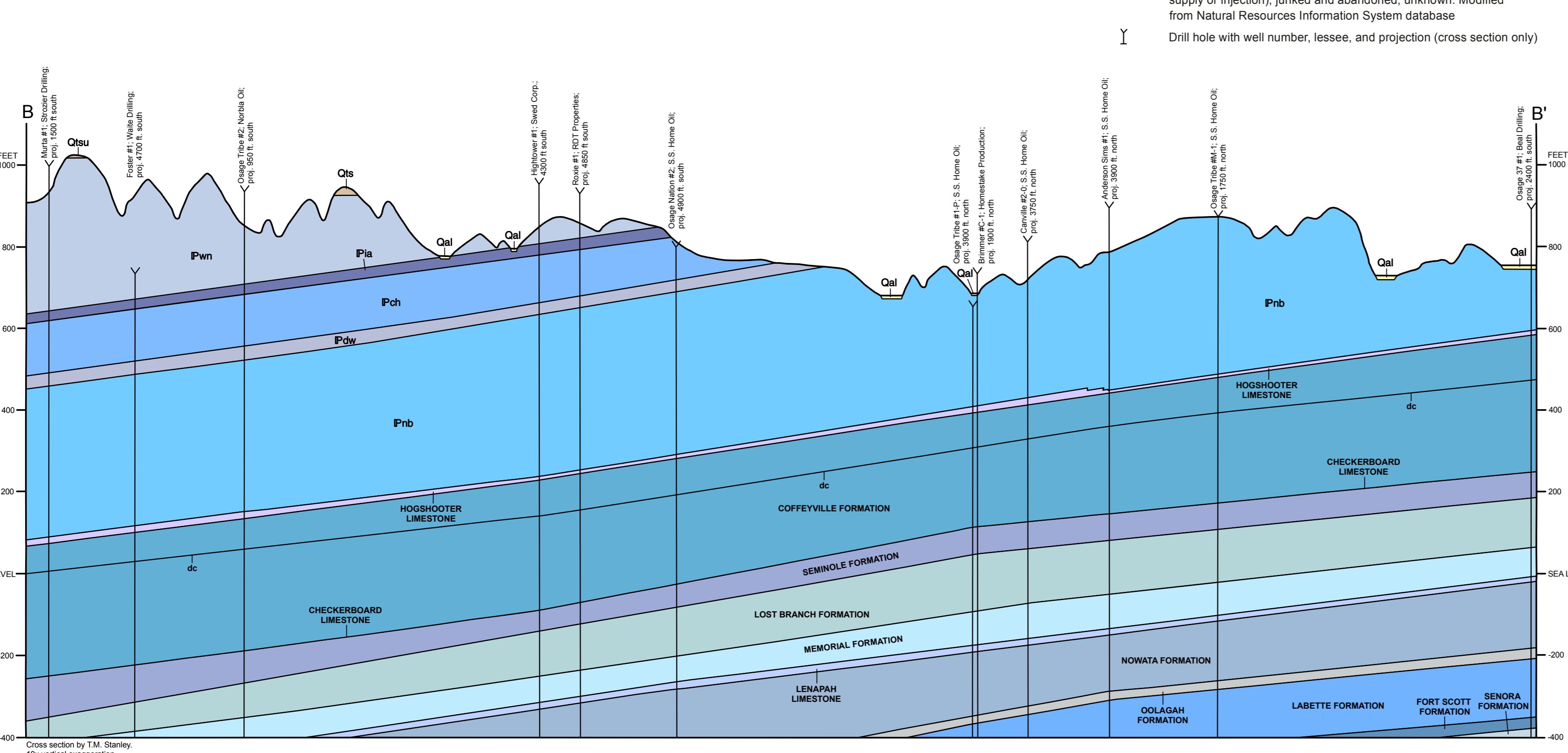
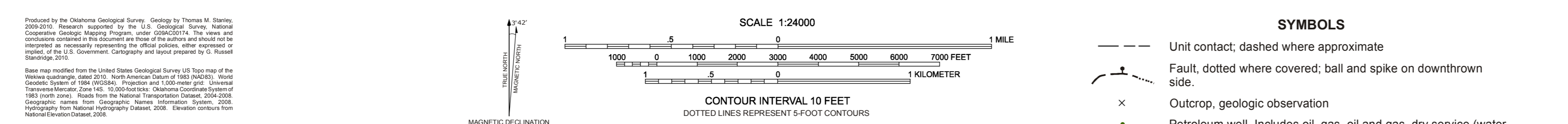


CORRELATION OF MAP UNITS



DESCRIPTION OF UNITS

- Qal** ALLUVIUM (Holocene)—Clay, silt, sand, and gravel in channels and on flood plains of modern streams. Includes terrace deposits of similar composition located directly above and adjacent to modern channels and flood plains. Thickness 0 to about 30 ft.
- Qao** OLDER ALLUVIUM (Holocene)—Mostly sand, with variable amounts of clay and silt-sized material, and little to no gravel-sized material; situated from 10 to 20 ft above modern flood plain terraces. Thickness at least 30 ft.
- Qts** TERRACE SANDS (Holocene and Pleistocene)—Extensive deposits occur along the north bank of the Arkansas river, consisting mainly of unconsolidated fine- to very fine-grained quartz sand, silt, and wind-blown loess, little to no gravel-sized material observed. Thickness from 0 ft to as much as 100 ft.
- Qtsu** UPPER TERRACE SANDS (Pleistocene)—Deposits of very fine- to fine-grained sand, with very little silt to clay-sized material, situated at least 250 ft above modern flood plain terraces. Thickness about 20 to 25 ft.
- Pwn** WANN FORMATION (Pennsylvanian, Missourian)—WANN FORMATION (Pennsylvanian, Missourian)—Consists of four predominant sandstone intervals interbedded with five predominant shale intervals. Sandstones very pale orange (10YR8/2), pale yellowish orange (10YR8/6) to moderate orange pink (5YR7/4), grayish orange pink (5YR7/2), and yellowish gray (5Y7/2); sandstone intervals vary between 5 to 15 ft thick, consisting of weakly indurated to indurated, fine- to medium-grained, locally coarse-grained at base of some sandstone intervals, calcareous to weakly siliceous, quartz-rich arenites; bedding planar, locally cross-laminated at base of some intervals, thin- to medium-bedded, varying from 1.5' to 6' thick; clayshale partings and thin (< 5' thick) interbeds locally near top of sandstone intervals; horizontal burrows, tracks, and tool marks common. The most prominent sandstone intervals are the Washington Irving Sandstone, located about 50 ft above the base, and the Clear Creek Sandstone, which is usually located from 90 to 100 ft above the formation's base. Shale intervals vary from 5 to as much as 50 ft thick, with the thicker shale intervals occurring at the base and top of the formation, and consist of yellowish gray (5Y7/2), dusky yellow (5Y6/4), and medium light gray (N6), becoming dark yellowish orange (10YR6/6) and moderate reddish brown (10R4/6) stratigraphically higher intervals; laminated to well-laminated, slightly silty to very silty clayshale and mudstone, with mudstone lithology being more common in upper part of formation; very fine-grained sandstone and siltstone interbeds common in the upper part of each shale interval. Thin (6' thick or less), argillaceous carbonate mudstones locally occur at the base of some shale intervals, particularly just above the Washington Irving and Clear Creek sandstone intervals. Thickness of the Wann Formation at least 500 ft, top not exposed.
- Pia** IOLA FORMATION (Pennsylvanian, Missourian)—Poorly exposed in quad. Consists of three members, which are, in descending order: 1) Avant Limestone; 2) Muncie Creek Shale; and 3) the Paola Limestone. Total thickness of the formation varies from 48 to 63 ft, depending on the thickness of the middle clastic unit within the Avant Limestone. Avant Limestone: In the Wekiwa Quad, the Avant consists of an upper and lower limestone, separated by and an intervening interbedded sandstone and shale interval. The Avant Limestones are typically medium gray (N6) to medium light gray (N6), medium to locally thick bedded, algal wackestones and mudstone; bedding is irregular, and varies from 3' to as much as 4' in thickness; the upper Avant Limestone is the thicker of the two limestone intervals, and attains a thickness between 10' to 20', the lower Avant Limestone is usually 3' thick or a little less. The intervening clastic interval is about 10' to 15' of fine-grained sandstone interbedded with slightly silty clayshale; shale is more common in the lower half of this interval. Muncie Creek Shale: Predominantly a medium gray (N6), well-laminated, slightly silty, calcareous, fossiliferous clayshale, basal 2' to 5' a dark gray (N3) to grayish black (N2), fissile, phosphatic clayshale; fossils mostly include chonetid brachiopods, ramose and fenestrate bryozoans, and crinoid debris. Thickness of the Muncie Creek Sandstone by previous investigators (Benison and others, 1972), although upper and lower contacts of this sandstone are obscure in the mapping area; in one good exposure, the Shell Creek Sandstone is thick and massive with thin interbedded shales; in another place, the sandstone appears to be thin-bedded. Other sandstones observed within the Nellie Bly range from laminated to medium-bedded and are commonly planar. Locally wavy. Interbedded shales are a light olive gray (5Y 5/2, 5Y 6/1) to olive gray (5Y 4/1), and consist predominantly of slightly silty claystones to mudstones, although clayshale textural bedding is not uncommon; paleosol development and curved slickenside fractures common in mudstone and claystone lithologies. The shale may have curved weathered surfaces. In some concretionary sandstones may be present within shales; concretions commonly moderate yellowish brown (10YR 5/4) to moderate brown (5YR 4/4) in color. Thickness of Nellie Bly Formation at least 300 ft, base not exposed in quad.
- Pch** CHANUTE FORMATION (Pennsylvanian, Missourian)—Mostly a grayish orange (10YR7/4), grayish orange pink (5YR7/2), pale yellowish brown (10YR6/2), to medium light gray (N6), laminated to blocky bedded, weakly calcareous, very silty clayshale to mudshale; silt content and loss of bedding in shale increases toward top of formation. Locally, an 8' to 10' thick, indurated, laminated to thin-bedded, fine to very fine-grained sandstone that may correlate to the Cottage Grove Sandstone, occurs near the top of the formation. The Thayer Coal also occurs in the formation, but was not observed in the field area. Total thickness of the formation about 130 ft.
- Pdw** DEWEY FORMATION (Pennsylvanian, Missourian)—Consists of two, thin, slightly sandy limestone beds with intervening shale and sandstone interval. Limestones are moderate red (5R4/6), moderate reddish brown (10R4/6), to dusky red (5R3/4), thin-bedded to locally laminated, sandy, fossiliferous packstone to rarely grainstone, with grainstone texture more common in upper-most limestone bed; fossils dominated by small bivalves, high-spired gastropods, and crinoid debris. Thickness of both limestone beds average 2 ft, although upper limestone may achieve thicknesses in excess of 3 ft. Intervening clastic interval mostly dark yellowish brown (10YR6/6) to moderate reddish brown (10R4/6), laminated, calcareous, fossiliferous clayshale, grading upward into very fine-grained, laminated sandstone and siltstone; large productid brachiopods common in shale interval. Total thickness about 40 ft.
- Pnb** NELLIE BLY FORMATION (Pennsylvanian, Missourian)—Consists of interbedded sandstone, siltstone, and shale, none of which can be easily mapped into separate units. Sandstones vary from yellowish gray (5Y 7/2), dusky yellow (5Y 6/4, when moist), pale yellowish orange (10YR 6/6), grayish orange (10YR 7/4), and pale greenish yellow (10Y 6/2) when fresh; commonly dark yellowish orange (10YR 6/6), although it may be moderate yellowish brown (10YR 5/4) or light brown (5Y 5/6) weathered; all exhibit moderate induration, rarely friable, are quartz-rich, fine- to very fine-grained, and non-calcareous, although some bedding surfaces may be calcareous due to the precipitation of calcite. Fe-oxide spots, trace fossils, laminations and cross-laminations, ripple marks, and tool marks are common along bedding surfaces; mud clasts and pitting from weathering of mud clasts are sometimes observed, and soft-sediment deformation is rare. Some prominent sandstones do occur locally: a thin- to medium-bedded (1-3 ft thick), homogenous sandstone is the first sandstone observed above the Hogshooter Formation. Another is located in the western part of the mapping area and has been named the Shell Creek Sandstone by previous investigators (Benison and others, 1972), although upper and lower contacts of this sandstone are obscure in the mapping area; in one good exposure, the Shell Creek Sandstone is thick and massive with thin interbedded shales; in another place, the sandstone appears to be thin-bedded. Other sandstones observed within the Nellie Bly range from laminated to medium-bedded and are commonly planar. Locally wavy. Interbedded shales are a light olive gray (5Y 5/2, 5Y 6/1) to olive gray (5Y 4/1), and consist predominantly of slightly silty claystones to mudstones, although clayshale textural bedding is not uncommon; paleosol development and curved slickenside fractures common in mudstone and claystone lithologies. The shale may have curved weathered surfaces. In some concretionary sandstones may be present within shales; concretions commonly moderate yellowish brown (10YR 5/4) to moderate brown (5YR 4/4) in color. Thickness of Nellie Bly Formation at least 300 ft, base not exposed in quad.
- HOGSHOOTER FORMATION (Pennsylvanian, Missourian)**—A skeletal to whole-fossil carbonate mudstone to wackestone; found only in the subsurface.
- COFFEYVILLE FORMATION (Pennsylvanian, Missourian)**—Interbedded sandstone and shale, the most prominent sandstone being the Dodds Creek Sandstone (base of interval marked as 'dc' on cross section); found only in the subsurface.
- CHECKERBOARD LIMESTONE (Pennsylvanian, Missourian)**—A dense skeletal to whole-fossil carbonate mudstone to wackestone; found only in the subsurface.
- SEMINOLE FORMATION (Pennsylvanian, Missourian)**—Formation consists of a lower sandstone interval, called the Tulsa Sandstone, and a basal interval of interbedded with laminated, concretionary, silty clayshales, mudshales and siltstones. The Tulsa coal also occurs within the uppermost shale interval, just above the top of the Tulsa Sandstone; found only in the subsurface.
- LOST BRANCH FORMATION (Pennsylvanian, Desmoinesian)**—Overall, a laminated, slightly calcareous, micaceous, silty clayshale, phosphatic clayshale, and thin limestone beds; found only in the subsurface.
- MEMORIAL FORMATION (Pennsylvanian, Desmoinesian)**—Interbedded sandstones and shales with prominent coal bed at top; found only in the subsurface.
- LENAP LIMESTONE (Pennsylvanian, Desmoinesian)**—A thin, skeletal to whole fossil wackestone to packstone textured limestone; found only in the subsurface.
- NOWATA FORMATION (Pennsylvanian, Desmoinesian)**—A blocky bedded to weakly laminated, slightly silty, concretionary clayshale; found only in the subsurface.
- OOLAGAH FORMATION (Pennsylvanian, Desmoinesian)**—A thin- to medium-bedded, skeletal carbonate mudstone to wackestone; found only in the subsurface.
- LABETTE FORMATION (Pennsylvanian, Desmoinesian)**—A laminated, very silty to sandy, micaceous, concretionary clayshales, interbedded with fine-grained sandstones near top; found only in the subsurface.
- FORT SCOTT FORMATION (Pennsylvanian, Desmoinesian)**—Thin to medium, wavy bedded whole-fossil wackestones and mudstones, interbedded with fissile, phosphatic clayshale; found only in the subsurface.
- SENORA FORMATION (Pennsylvanian, Desmoinesian)**—Complex sequence of silty and concretionary clayshale, interbedded with very fine-grained sandstones, siltstones and coal; found only in the subsurface.



GEOLOGIC MAP OF THE WEKIWA 7.5' QUADRANGLE, OSAGE, PAWNEE, AND TULSA COUNTIES, OKLAHOMA
Thomas M. Stanley
2010