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# CENOZOIC SEDIMENTARY ROCKS OF TONTO BASIN

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## INTRODUCTION

The name Tonto Basin has been used for all of the area drained by Tonto Creek, from its headwaters along the Mogollon Rim to its confluence with the Salt River at Roosevelt Lake, and also for smaller divisions within the drainage area. Some maps show the Tonto Basin as the area near Payson, others show it in the headwaters of Tonto Creek, and still others as the lower valley of Tonto Creek, where the creek flows slightly east of south between the Mazatzal Mountains and the Sierra Ancha to enter Roosevelt Lake. The settlement and post office of Tonto Basin is in the last area, 22 miles north of Roosevelt Dam. The settlement is also known as Tontobasin, Packards, Pumpkin Center, and Punkin Center.

Feth (1954, fig. 3), in describing separate basins of lake-bed deposition in central Arizona, designated the lower reaches of Tonto Creek as the Tonto Basin, in distinction from the basin along Rye Creek to the north, which he called the Payson Basin. Feth's usage is followed here. The beds he discussed as Tonto Basin beds are now known, from fossils, to be at least in part of Pliocene age (Lance, 1960).

No detailed study seems to have been published on Cenozoic deposits in Tonto Basin, as here used. The present report is based on a brief study of the area within a few miles of fossil localities east of Punkin Center store, and reconnaissance in other parts of the basin. Interpretations are necessarily tentative.

## DISTRIBUTION AND THICKNESS

The Tonto Basin beds are exposed in a curving band along both Salt River and Tonto Creek near where the streams enter Roosevelt Lake. The band varies from about 6 to 12 miles in width, and extends for about 40 miles, from the area where the Globe-Young road crosses Salt River to the narrows, or Box of the Tonto, 8 miles north of Punkin Center store. The beds are particularly well exposed along the north side of Roosevelt Lake, and on the east side of the Payson road north of Roosevelt Dam.

Relief between exposures on the shore of the lake and the highest beds that lap against Precambrian rocks of the Sierra Ancha is about 1,000 feet, and this is probably the approximate thickness of the exposed section. The amount of section below the present valley floor is unknown. The beds were deposited on a surface of high relief. Granite ridges and knobs buried by the beds are exposed at the foot of the Sierra Ancha east of Punkin Center, and several hills of Precambrian and Paleozoic rocks project above the valley floor near Roosevelt Lake.

## LITHOLOGY

The Tonto Basin beds are dominantly sandstone, siltstone, and claystone, but include conglomerate, tuff, gypsum, and thin marl beds. Red is the outstanding color, but green, pink, white, yellow, gray, and brown beds are prominent locally. Feth (1954) noted the striking resemblance of the beds to some of the Triassic formations of Northern Arizona. He also contrasted the red and green color of the Tonto Basin beds with the prevailing creamy yellow to white color of sediments in the Payson

Basin to the northwest, and the San Carlos Basin to the southeast.

Partial sections measured at three places, one 5 miles east, one 2.5 miles south, and another 4.5 miles south of Punkin Center store, suggest a recognizable sequence of deposits in the northern end of the basin. The lowest unit exposed is a thick sequence of red beds, of clay to sand size. Above is a zone, as much as 300 feet thick in places, of red beds containing abundant gypsum. Above this are light-colored beds of clay, silt, tuff, and marl. This unit, which appears to be locally developed and only a few tens of feet thick, contains fossils. What appears to be the same tuffaceous silt bed, about 3 feet thick, is exposed at the fossil locality 4 miles east of Punkin Center store, at Haystack Butte 2 miles east of the store, and at another locality 1.5 miles west of the store.

The gypsum zone appears to thin northward, and near Punkin Center store it is not present between the lower red beds and the light-colored zone. North of the store, the red beds grade into a conglomerate that is exposed for about 3 miles south of the place where Tonto Creek cuts a gorge through Precambrian schist south of Jake's Corner. Marginal conglomeratic facies of the red beds are also present at places along the eastern side of the Mazatzal Mountains, next to the mountains south of Roosevelt Lake, and along the southern edge of the Sierra Ancha. No marginal conglomerates of any significance appear to be present along the west front of the Sierra Ancha, where fine-grained beds lap against the Precambrian rocks in a number of places.

Two basalt flows appear to be interbedded with the marginal conglomerates near the Mazatzal Mountain front along Slate Creek in the northwestern part of the basin. The exact position of these flows in the section is not known.

## RELATIONSHIPS TO OLDER AND YOUNGER ROCKS

The Tonto Basin beds rest on Precambrian granite in most places, but locally on schist, Tertiary dacite, or on sedimentary rocks of Precambrian and Paleozoic age. At the north end of the basin the basal conglomerate lies, with what seems to be an angular unconformity, on an older conglomerate composed of angular cobbles and boulders of schist. A similar relationship to an older conglomerate is suggested by a few exposures near the west end of Roosevelt Lake.

Overlying the Pliocene beds are gravels of several types, including those formed as pediment caps, stream floodplain deposits, and thin alluvial fans. The floodplain deposits are exposed along the main drainage and its tributaries, and several terraces of minor extent are cut in alluvium along stream courses. Most of the deposits younger than Pliocene beds have the form of pediment-capping material, red or brown in color, and from 3 feet to 15 feet thick in most places. This material is poorly sorted, and contains fragments ranging up to boulder size. Only one major pediment seems to be well developed.

## AGE AND ENVIRONMENT

Beds in a small area 4 miles east of Punkin Center

store contain vertebrate fossils, snails, ostracods, and plant remains. The vertebrate remains include teeth of a small camel, and a single horse tooth identifiable as belonging to the genus *Pliohippus*. The horse tooth, which was discovered by Floyd Twenter, definitely places the age of the beds as Pliocene, and the stage of evolution represented suggests that they are not in the latest part of the Pliocene.

The invertebrate fossils, which are from a silicified marl, have not been studied in detail. The snails are similar to forms found in lake deposits in several late Cenozoic beds in Arizona, and are useful, along with the ostracods and some of the plant remains, in suggesting the presence of lakes during time of deposition of the beds.

Plant remains include poorly preserved stem and leaf impressions, oogonia, or fruitlets of charophytes, and pollen. Charophytes suggest quiet-water deposition. Of greatest interest in the plant material is a small pollen flurvie extracted from a carbonaceous layer within a few inches of the *Pliohippus* tooth.

Gray (1960) reported that most of the plants identified from pollen are now present in the vicinity, but not necessarily in the same proportions. She concluded that if the abundance of chenopod-amaranth in the sample was related to soil alkalinity conditions, "it would appear that the Pliocene vegetation of this area, now desert, was a woodland-savanna community, dominated by pine."

#### STRUCTURE

The Tonto Basin beds are generally flat-lying, but are locally tilted, faulted, and folded. The steepest dip observed is 10° basinward, along the eastern edge of the basin. Within the basin are several broad, open folds, with dips on the flanks of a few degrees. Limited observations suggest that in the northern end of the basin the section as a whole dips gently toward the Mazatzal Mountains, but with a reversal of dip near the mountain front.

Dips near the mountain fronts may be in part the result of initial dip, possibly combined with later movement. Some of the folding is probably the result of dif-

ferential compaction. An exposure near the fossil locality shows that fine-grained beds dip gently away from a buried granitic knob or ridge.

At the north end of the basin, 2 miles south of the narrows, a normal fault, dipping steeply to the south, brings the basal conglomerate into contact with the underlying sharpstone conglomerate. The displacement is believed to be not more than a few tens of feet.

The Pliocene beds appear also to be faulted at several places along the base of the Mazatzal Mountains, although relationships were not mapped. It is possible that the basalt flows along Slate Creek may be related to faulting along the Mazatzal Mountain front, but this is not certain. No faulting has been observed to displace the Pliocene beds along the west and south sides of the Sierra Ancha.

An adequate study of structural relationships of the Pliocene deposits of Tonto Basin would be desirable because the basin is situated along a line that has been suggested as a structural and physiographic boundary between the Colorado Plateaus and the Basin and Range Provinces by several authors (Heindl and Lance, 1960). Although there has obviously been some structural movement since the early or middle Pliocene, the only evidence for differential movement between the basin and adjacent mountain blocks seems to be along the eastern side of the Mazatzal Mountains, and the extent of such movement is not known.

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