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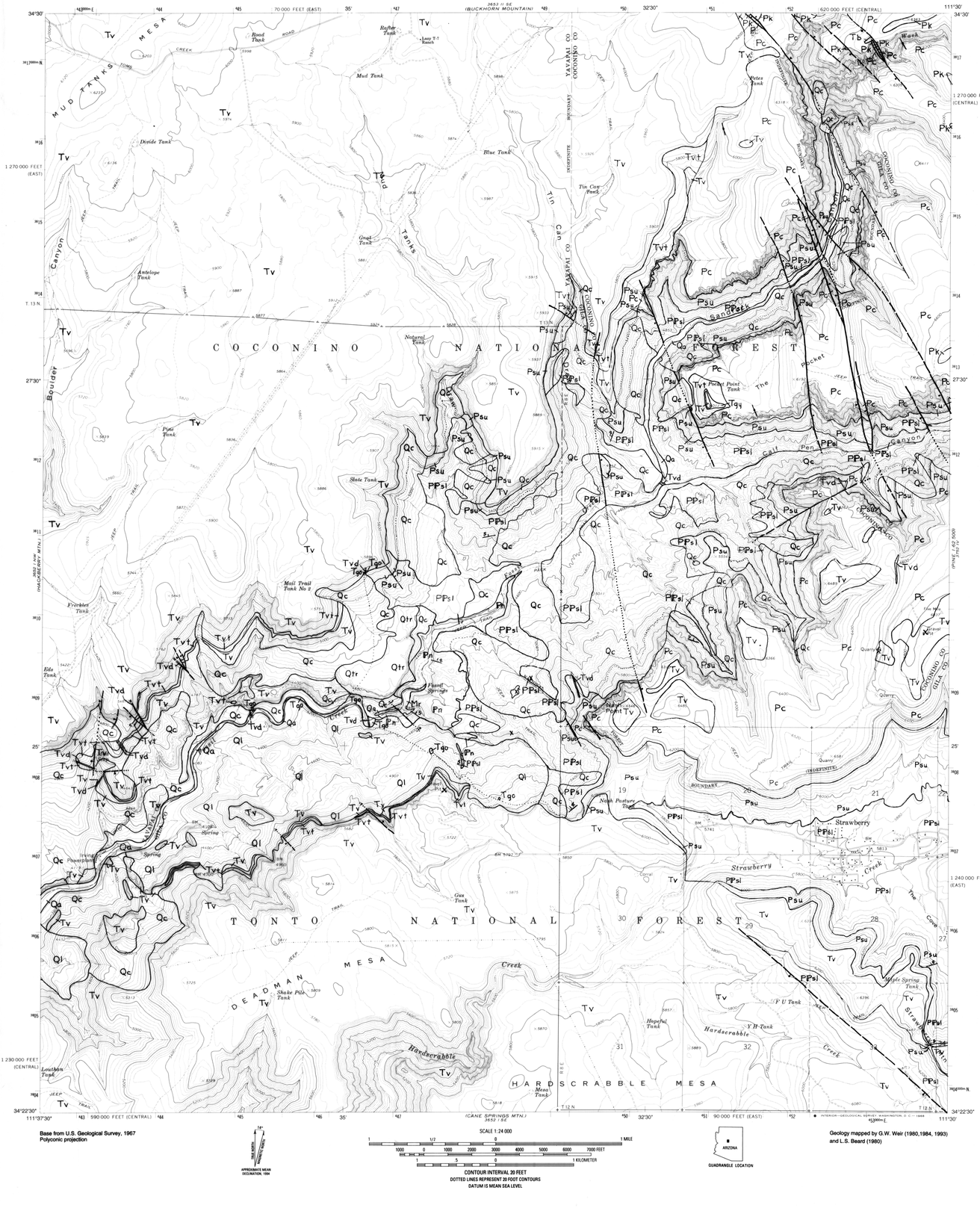

CORRELATION OF MAP UNITS

Qa Qc	Holocene	QUATERNARY
Ql Qtr	Holocene and Pleistocene	
Unconformity		
Tgy Tv Tvt Tvd	Pliocene? and Miocene	TERTIARY
Unconformity		
Tgo	Eocene? and Paleocene?	
Unconformity		
Pk	Lower Permian	PERMIAN
Unconformity		
Pc Psu PPsl Pn	Lower Permian and Upper and Middle Pennsylvanian	PERMIAN AND PENNSYLVANIAN
Unconformity		
Mr	Middle Pennsylvanian	PENNSYLVANIAN
	Lower Mississippian	MISSISSIPPIAN

DESCRIPTION OF MAP UNITS

Qa **Alluvium (Holocene)**--Gravel, sand, silt, and clay along Fossil Creek. Rounded cobbles and boulders of basalt dominant. Commonly grades into unmapped colluvium. Includes old stream deposits as much as 10 m above creek bed. Maximum thickness probably about 10 m.

Qc **Colluvium (Holocene)**--Irregular, sheetlike masses of rubble, composed chiefly of blocks of basalt and blocks of sandstone derived from Coconino Sandstone; locally includes blocks of limestone, dolomite, sandstone, and siltstone derived from Naco and Supai Formations. Boundaries commonly indefinite; grades locally into landslide deposits on steep slopes and into alluvium in valleys. Mapped contacts generalized; only large patches that mask bedrock are shown. Thickness irregular, maximum probably about 20 m.

Ql **Landslide deposits (Holocene and Pleistocene?)**--Jumbled lunate and irregular blocks, commonly tens to hundreds of meters across, and irregular masses of rubble of volcanic rocks; form hummocky topography on northwest-facing slopes south of Fossil Springs. Grades into and locally includes colluvium; boundaries commonly indefinite; contacts generalized. Large dissection of some blocks suggests that some sliding occurred during the Pleistocene. Maximum thickness probably about 30 m.

Qtr **Travertine (Holocene and Pleistocene)**--Yellowish-gray travertine, very fine grained, in part cavernous, of several generations. Includes at base an irregular layer, 1.5 to 6 m thick, of conglomerate, composed of pebbles to boulders as much as 1 m in diameter of basalt, and sandstone, conglomerate, limestone, and dolomite derived from Pennsylvanian and Permian formations; cemented by travertine and calcitic mudstone. Bulk of travertine on west side of canyon near Fossil Springs is as much as 60 m thick; forms conspicuous bench about 0.9 km wide and 1.2 km long. North of dam on Fossil Creek bench-forming travertine layer rests unconformably on Naco Formation; west of dam it rests on volcanic rocks and older Tertiary gravel; this thick layer of travertine probably marks horizons of springs during Pleistocene. Younger parts of travertine extend as tonguelike sheets on slopes below bench-forming layer and conform generally to modern topography. Unmapped lenses of travertine are scattered along creek. Travertine is still being deposited around Fossil Springs (Peth and Hem, 1962, p. 132).

Tgy **Younger gravel (Miocene)**--Composed of poorly sorted, subangular to subrounded pebbles to boulders, as much as 45 cm across, of light-brown sandstone derived from Coconino Sandstone, light- to medium-gray and grayish-red chert derived from Kaibab Formation, dark-gray basalt, and light-gray lithic tuff; in lens, as much as 30 m thick, in volcanic rocks near Pocket Point Tank in the northeastern part of quadrangle. Similar lenses may be present elsewhere in volcanic rocks beneath colluvium.

Tv **Volcanic rocks, undivided (Miocene)**--Mainly dark-gray, aphanitic to very fine grained basalt containing phenocrysts of olivine and pyroxene, commonly vesicular; in flow units about 6 to 12 m thick. Includes vent deposits of basaltic tuff and agglomerate, and dikes and beds of tuff too small to show separately.

The volcanic rocks commonly range from about 15 to 60 m in thickness on mesas; top is eroded. Unit thickens abruptly westward near Fossil Springs to more than 600 m; zone of thickening, not fully exposed, marks ancestral edge of the Colorado Plateau (Twenter, 1962; Peirce, 1987) as shown in figure 1. The inferred position of the basal contact buried beneath colluvium, travertine, and landslide is shown on the map by a dotted line.

Potassium-argon age determinations of 10.16 +/- 0.22 Ma and 9.30+/-0.21 Ma determined for basalts in flows above Fossil Creek suggest a Late Miocene age (Peirce and others, 1979, p. 6, 13-14). Buried part of volcanic sequence may correlate with older basalt in nearby areas dated as about 15 Ma.

Tvt **Lithic dacite tuff (Miocene)**--Relatively continuous beds and irregular lenses of light-yellowish-gray tuff, as much as 10 m thick; mapped where locally conspicuous in southwestern part of quadrangle.

Tvd **Dikes of basalt and agglomerate (Miocene)**--Near-vertical dikes, commonly 3 to 10 m wide; mapped only where intruding sedimentary rocks.

Tgo **Older gravel (Paleocene? and Eocene?)**--Weakly cemented conglomerate, light-brown to light-gray; composed mainly of pebbles to cobbles of varicolored chert and light- to dark-gray quartzite, light-gray and reddish-gray granite and gneiss, dark-gray diabase mottled with white, and fine-grained metamorphic rocks in a matrix of coarse-grained sandstone. Igneous and metamorphic rocks were derived from a Precambrian terrane that lay south of the quadrangle. Sedimentary clasts were derived from resistant units in Paleozoic formations of the area.

Deposits lie in three disparate settings: near rim of canyon, on slope below rim, and at base of slope in canyon of Fossil Creek (fig. 1).

Gravel near rim, about 375 m above creek, crops out in two small areas. It is fairly well exposed on north side of the canyon, about 1.7 km north-northwest of dam, in a gully 1.1 km east of Mail Trail Tank No. 2. A colluvium-obscured outcrop is on south side of canyon, about 1.6 km southeast of dam, along a jeep trail about 1.4 km southwest of Nash Point. Gravel near rim is about 10 m thick on north side of canyon. It may attain the same thickness on south side where the outcrop, only a few meters thick, is surrounded by colluvium and landslide deposits. Basalt and tuff crop out above gravel, and on the north side of canyon a basalt dike cuts through gravel. On the north side gravel lies on upper part of Supai Formation. On the south side it is inferred to lie on strata in lower part of Supai Formation.

Gravel on slope, about 230 m above creek, lies on a small point about 0.6 km south-southeast of dam. This exposure of gravel, only a few meters thick, is obscured by landslide and colluvium deposits. It is probably a thin lens resting on beds in lower part of Supai and overlain by basalt. Sparse float of Precambrian pebbles, derived from Tertiary gravel, is in colluvium on north side of canyon, above north part of bench of travertine. This float suggests that lenses of gravel may lie beneath colluvium on north side of canyon or that gravel near rim extends farther southwest than shown on map.

Gravel in canyon is exposed in scattered outcrops 0.3 to 1.9 km below dam. It attains a thickness of more than 60 m and is overlain by volcanic rocks and locally by travertine and colluvium; thin dikes of basalt intrude gravel. Base of the gravel is below level of Fossil Creek and is inferred to lie on beds in lower part of Naco Formation. Lowest outcrop of canyon gravel is about 290 m below slope deposit and more than 440 m below near-rim deposits.

Relations between gravel deposits at different levels are uncertain. Slope and canyon-bottom deposits may be downfaulted blocks once continuous with the rim deposits (Weir and Beard, 1984), but no faults with such large displacements have been identified. Canyon gravels may be fluvial deposits that accumulated in a topographic low at base of an ancestral Mogollon Rim, edge of the Colorado Plateau (Peirce, 1987); higher gravels may represent earlier periods of deposition. If all gravels were laid down during a continuous cycle of deposition, they covered topography that had hundreds of meters of relief, topped an ancestral Mogollon Rim, and spread over the Plateau (Twenter, 1961; Elston and Young, 1991, p. 12,392).

Age of older Tertiary gravels in the quadrangle is not closely defined. Samples of the overlying basalt from relatively high in section are of late Miocene age, but rocks near base of volcanic pile in Fossil Creek are undated (Peirce, 1987).

If gravel deposits are of different ages, near-rim and perhaps slope deposits may be Eocene(?) and canyon deposits Oligocene(?), as suggested by Peirce and Nations (1986, p. 113) for Tertiary gravels near the rim and in the Verde Valley.

Considered as the product of a continuous cycle of deposition, older Tertiary gravels of this quadrangle are probably correlative with lithologically similar deposits widely scattered near the plateau rim in Arizona, and commonly referred to as "Rim gravels" (Cooley and Davidson, 1963, fig. 10) and to gravel deposits in east-central Arizona that have been informally called "Mogollon Rim formation" (Potochnik, 1989, p. 110). Recent studies of Rim gravels indicate that they range in age from late Paleocene to late Eocene on the basis of K-Ar ages of volcanic clasts, gastropods, magnetic polarity, pollen, and dated volcanic ash beds (Elston and Young, 1991, p. 12,394).

Pk **Kaibab Formation (Lower Permian)**--Limestone, dolomite, and sandstone. Limestone and dolomite are light gray and yellowish gray, very fine grained to fine grained, in part sandy; commonly contain irregular nodules a few centimeters across of reddish-brown and medium-gray chert; fragments of silicified brachiopods and crinoids common in a few limestone beds; large whole brachiopods abundant in bed about 9 m above base. Sandstone is light brown, fine grained, bioturbated, in layer about 0.6 m thick at base and in thin lenses interbedded with limestone and dolomite. Formation weathers to a mantle of chert and silicified fossils. Locally overlain unconformably by basalt. Base, rarely exposed, rests on a regional unconformity that unevenly truncates crossbeds of Coconino Sandstone. Kaibab crops out only in northeastern part of quadrangle where it caps a few mesas; reaches maximum thickness of about 45 m in small graben on north side of Horsetank Wash.

Pc **Coconino Sandstone (Lower Permian)**--Sandstone, very light grayish orange to pale orange, weathers grayish orange; composed of very fine to fine, subrounded grains of quartz and minor amounts of chert and feldspar; firmly cemented by silica. In planar sets, commonly about 1 m thick, of high-angle crossbeds; near base are a few layers of horizontal beds. Forms steep cliffs rimming canyons of Fossil Creek and its tributaries; caps most mesas in eastern part of quadrangle. Overlain unconformably by volcanic rocks and by Kaibab Formation.

Base of formation, commonly at or near base of cliff, mapped at top of highest bed of reddish-brown siltstone in Supai Formation in a zone about 6 to 30 m thick of transitional lithology that includes layers of crossbedded sandstone. Formation about 300 m thick where overlain by Kaibab Formation.

Psu **Supai Formation, upper part (Lower Permian)**--Siltstone, shale, sandstone, and limestone. Siltstone and shale, reddish-brown, clayey to very fine sandy, in laminated to thin-bedded layers commonly 0.3 to 3 m thick; form slopes. Sandstone, reddish-brown, brownish-gray, and grayish-orange, very fine to medium-grained, micaceous, well-cemented by calcite; mostly in thin-bedded layers 0.3 to 3 m thick but includes near top layers of high-angle crossbeds similar to Coconino Sandstone; forms ledges. Limestone above Fort Apache Member is light to medium gray, fine grained, in ledge-forming, thin-bedded layers about 0.5 to 6 m thick. Silicified fossils from limestone beds about 18 m above Fort Apache Member (USGS colln 27768-PC) included indeterminate bryozoans, a scaphopod, Plagioglypta canna (White) identified by E.L. Yochelson, and mollusks Nuculopis (Nuculanella) obliqua (Girty), Parallelodon sp., Schizodus suquaiensis Winters, Permophorus sp., and Aparchella franciscana (Chronic) identified by Mackenzie Gordon Jr.. Gordon (written commun., 1981) noted that the mollusks suggest that age of this higher limestone probably does not differ materially from that of Fort Apache Member at base of upper part of Supai Formation.

Fort Apache Member is mostly light to medium gray, locally silty to sandy, fine-grained limestone in beds 0.1 to 1 m thick; in places includes lenses of less resistant, yellowish-gray, fine-grained calcitic limestone. Member apparently unfossiliferous in quadrangle; its fossils in eastern Arizona indicate an Early Permian (early Leonardian) age (Winters, 1963, p. 15); conodonts collected from the member in the central Mogollon Rim region suggest an age not younger than late middle Leonardian (Wardlaw cited by Peirce, 1989, p. 362). On canyon walls the Fort Apache commonly forms a conspicuous ledge, 7 to 12 m thick. On slopes bordering Strawberry Valley it crops out poorly and is difficult to identify.

Upper part of Supai Formation above ledge of Fort Apache forms steep slope studded with a few ledges of limestone and sandstone. Thickness ranges from about 105 to 135 m; differences in thickness caused in part by different placements of upper contact in zone of interlensing, transitional lithology.

PPsl **Supai Formation, lower part (Lower Permian and Upper and Middle Pennsylvanian)**--Siltstone, shale, sandstone, conglomerate, and dolomite. Siltstone, shale, and sandstone generally similar to clastic rocks in upper part of formation. Gray carbonaceous siltstone and shale containing coaly fragments and impressions of plant material interbedded with conglomerate about 120 m above base of formation; locally radioactive and impregnated with copper minerals (Peirce and others, 1977, p. 33-34). Conglomerate, mostly light gray and reddish brown, is composed of subrounded, commonly rod-shaped, pebbles as much as 10 cm in diameter of gray and reddish-brown limestone and calcitic mudstone in a calcitic siltstone matrix; in lenses estimated -to be as much as 2 m thick and 300 m long, irregularly interbedded in finer-grained clastics in zone 6 to 15 m thick about 120 m above base. Dolomite, mostly reddish brown, very fine grained and locally silty; in discontinuous beds as much as 1 m thick mostly near top and base. Carbonaceous beds near top of lower third of unit yielded spores and pollen indicative of Early Permian (early Wolfcampian) age (Kremp, 1975); beds in lower part of unit were correlated by Huddle and Dobrovolny (1945, sec. 2) with strata of Pennsylvanian age. Thickness of lower part of Supai about 365 m; total thickness of formation about 485 m.

NOTE: In this report the divisions and nomenclature of the sequence of rocks between the Redwall Limestone and the Coconino Sandstone are approximately those used by Huddle and Dobrovolny (1945, sec. 2). Members defined by McKee (1975) in the Grand Canyon were not recognized. Alternative informal divisions of the Supai and Naco Formations were set forth by Peirce and others (1977), Blakey (1979a, b; 1989), Elston and Di Paolo (1979), and Peirce (1989). Blakey (1990) presented a formal division that at Fossil Creek divides the sequence, in ascending order, into the Naco Formation, the Supai Formation (divided into lower and upper parts), and the Schnebly Hill Formation (divided into four members). Comparison of the units proposed by Blakey (1990, fig. 2) with the units mapped in this quadrangle shows large differences. The Naco Formation, as mapped, includes the Naco and also some of the lower part of the Supai Formation as used by Blakey (1990). The mapped lower part of the Supai Formation includes the upper part and most of the lower part of the Supai as used by Blakey (1990), as well as approximately the basal half of his proposed Schnebly Hill Formation. The upper part of the Supai Formation, as mapped, is approximately the upper half of the proposed Schnebly Hill Formation.

Pn **Naco Formation (Middle Pennsylvanian)**--Limestone, dolomite, siltstone, shale, sandstone, and conglomerate. Limestone and dolomite, grayish-red and brownish-gray, mostly micrograined to very fine grained, in part silty and sandy; locally contains small irregular concretions of reddish-brown chert; in even to nodular beds, commonly 0.3 to 1 m thick; a few beds in lower part of formation contain foraminifera and fine to coarse fragments of mollusks; form ledges. Siltstone, shale, and sandstone, grayish-red to reddish-brown, similar to reddish-brown, fine-grained rocks in Supai Formation. Conglomerate is composed of angular fragments of reddish-brown and dark-gray chert in firmly cemented, reddish-brown sandstone; in lenses about 1 m thick in a ledge-forming basal unit, 3 to 6 m thick, resting on an irregular, regional unconformity. Mollusks collected by Huddle and Dobrovolny (1945) and foraminifers collected by Brew (1965) from limestone beds in lower part of formation near Fossil Creek indicate a Middle Pennsylvanian (Desmoinesian) age. Foraminifers collected during this study (USGS colln. F14334) from limestone about 25 m above the base of Naco were identified by R.C. Douglass as Beedinia sp., probably B. leei Skinner, indicative of a Middle Pennsylvania (Desmoinesian) age. Naco Formation, as mapped in this quadrangle, is about 120 m thick.

Mr **Redwall Limestone (Mississippian)**--Limestone, light-gray and pinkish-gray; mostly micrograined but in part medium grained; locally contains abundant coarse fossil fragments; irregular concretions of reddish- to dark-gray chert are mostly in upper part of formation; in beds commonly 0.3 to 1.2 m thick; top 3 to 5 m contains abundant irregular seams and pods of reddish-brown mudstone. Fossils include foraminifers, brachiopods, and colonial corals (McKee and Gutshick, 1969, p. 150, 166, 676). Foraminifers indicate an Early Mississippian (Osagean) age (Skipp, 1969, p. 179, 181). Forms ledges near dam and walls of narrow gorge below dam. Base of formation below drainage; about 27 m exposed.

DESCRIPTION OF MAP SYMBOLS

- Contact - dotted where concealed
- Fault - dashed where approximately located; dotted where concealed; queried where conjectural. Bar and ball on downthrown side.
- Strike and dip of beds: Inclined; Approximate
- Strike and dip of vertical joints
- Prospect pit (copper-uranium)
- Quarry

GEOLOGIC SUMMARY

INTRODUCTION

The Strawberry quadrangle lies near the south boundary of the Colorado Plateau. This part of the plateau is characterized by steep-walled canyons cut into a high tableland of relatively flat-lying Paleozoic sedimentary rocks, veneered locally by Tertiary volcanic rocks. The chief elements modifying the plateau in this quadrangle are the canyons of Fossil Creek and its tributaries and the hills north and south of the valley of Strawberry Creek. Elevations range from about 3,700 ft in Fossil Creek to about 6,630 ft on the hill north of Strawberry.

Probably less than a hundred people are permanent inhabitants in the quadrangle. A few families live near the Irving power plant and a few live in the part of the town of Strawberry shown on the map. However, from late spring to early autumn the population may increase to several hundred as people move to the cool highlands to occupy cabins, recreational vehicles, and campsites. Much of the area is public land within the Tonto and Coconino National Forests; it includes most of the Fossil Springs Wilderness. A paved road leads to Payson, about 24 km south, the main supply point for the area. An unimproved road extends west from Strawberry to the Irving plant. Most of the area is accessible only with difficulty on rocky trails.

Sedimentary formations exposed in the quadrangle have an aggregate thickness of more than 1,100 m and range in age from Mississippian to early Tertiary. Late Tertiary basalt covers much of the area and probably attains a thickness of many hundreds of meters near the south and west edges of the quadrangle. The structure is simple. Most of the Paleozoic rocks are inclined gently to the north and west. Faults in Paleozoic rocks have displacements ranging from a few meters to more than 100 m. Faults in volcanic rocks are obscure. Some faults are older than the basalt and may be pre-Tertiary.

STRUCTURE

The prevailing dip of the Paleozoic rocks is low (1 - 5°) to the north and west. Near faults the strata commonly dip more steeply (10 - 40°). Volcanic rocks are flat-lying on mesas in the northern part of the area, but south of Fossil Springs they probably dip gently (1 - 3°) to the south or southwest. The Paleozoic rocks are broken into several blocks by high-angle normal faults that have displacements generally ranging from a few tens of meters to about 120 m. Many faults that cut Paleozoic strata may also cut the volcanic rocks, but because of poor exposures and lack of lithologic contrasts, few faults can be traced with certainty across plateau tops. Some faults that appear to die out near the margin of the volcanic cover are probably pre-Miocene and perhaps pre-Tertiary. Faults of pre-Tertiary age have been documented in nearby areas (Weir and others, in press; Weir and Nealey, 1983). An example of a probable pre-Miocene or pre-Tertiary fault is on the southwest side of Strawberry Mountain; this fault may be a continuation of the Diamond Rim Fault of Titley (1962). A linear structural discontinuity here places the lower part of the Supai Formation against volcanic rocks, chiefly basalt flows. The discontinuity dies out under volcanic rocks near the northwest end of the mountain. If this fault is pre-Miocene, the basalt flowed over irregular topography much like that of the present day.

A pre-volcanic (Twenter, 1962; Peirce, 1987), possibly pre-Tertiary, edge of the Colorado Plateau is buried under basalt and Tertiary gravel in the canyon of Fossil Creek near Fossil Springs (fig. 1). According to Peirce (1987), this locality is the junction of ancient west-trending and north-trending segments of the plateau edge. Magnetic highs west of Fossil Springs that imply a thick sequence of basalt in the western part of the quadrangle may support this interpretation (Davis and Weir, 1984).

ECONOMIC GEOLOGY

Field studies of the area were made by the U.S. Geological Survey and the U.S. Bureau of Mines in 1980-81 as part of a mineral survey of a wilderness area along Fossil Creek (Weir and others, 1983; Beard and Ellis, 1984). These studies indicate that the mineral resource potential of the Strawberry quadrangle is low. Prospects for copper minerals and radioactive carbonaceous material are in the Supai Formation. Several formations have been quarried. The oil and gas potential is uncertain but probably low.

Four copper-uranium prospects, consisting of about 400 m of cuts and trenches, are in a discontinuous gray zone, several meters thick, in the lower part of the Supai Formation. Three prospects are on the south side of Fossil Creek below Nash Point; one is on the north side of the creek near Mud Tanks Draw. The gray zone is made up of light-gray limestone-pebble conglomerate and sandstone, and medium-gray carbonaceous shale interbedded with lesser amounts of reddish-brown siltstone, shale, and sandstone. The prevailing light gray of the zone contrasts strongly with the brownish red characteristic of the Supai. Strata in the gray zone dip northeastward to near the mouth of Calf Pen Canyon where they are cut off by a fault that drops the zone below creek level.

Spots of copper minerals occur locally in the gray zone as coatings of sand grains, as blebs in carbonaceous shale and in pebbles and matrix of conglomerate, and as fillings of fractures and cavities. Malachite, azurite, bornite, chalcocite, chalcopyrite, and covellite are the chief copper minerals (Peirce and others, 1977, p. 33; Rogers, 1977, p. 21). The sparsely mineralized rock occupies only a small part of the gray zone, commonly in layers only a few centimeters to about a meter thick and several meters long. Because the mineralized rock is thin and low grade, the copper occurrences were judged to have little economic potential (Weir and others, 1983, p. 11).

Slightly high anomalous radioactivity was detected in coaly layers in carbonaceous shale of the gray zone, but no uranium minerals were recognized. A gamma-ray spectrometer study by the U.S. Bureau of Mines of prospects on the south side of Fossil Creek indicated that about half the radiation was from potassium, the rest from uranium. Peirce and others (1977, p. A8) reported a maximum of 90 ppm uranium in samples from the gray zone. Four samples collected from the prospects by the U.S. Bureau of Mines ranged from only 2 to 5 ppm U_3O_8 (Weir and others, 1983, p. 11). These analyses suggest that the uranium potential of the area is very low. Flagstone has been quarried from two small workings in the Coconino Sandstone about 1 and 2 km north of Strawberry (Keith, 1969, p. 444). Basalt, used locally as road material, has been quarried from two pits about 2.5 km north of Strawberry and a pit about 2 km southwest of Nash Point. Limestone of the Redwall Limestone crops out in Fossil Creek but probably contains too much chert to have commercial value. Travertine of possible use as a decorative rock crops out only in relatively small lenses along the creek outside of the Fossil Creek Wilderness.

The oil and gas potential of the area appears low. Formations not breached by Fossil Creek are mostly clastic and carbonate rocks of Mississipian and Devonian age. These subsurface formations may be petroliferous but have not yielded oil in central Arizona (Peirce and Wilt, 1970, p. 53-56). Four test wells have been drilled within about 30 km of the quadrangle; all were dry and have been plugged and abandoned (Peirce and Scurlock, 1972, p. 161, 162, 170; Conley, 1975).

The copper-bearing carbonaceous beds in the gray zone of the lower part of the Supai Formation were mentioned by Ransome (1916, p. 160) and by McGoon (1962) as a possible coal resource. The carbonaceous material consists mostly of fragments and flakes of coalified plant material scattered in gray shale and as wispy seams of lignite, a fraction of a centimeter to several centimeters thick, interbedded in lenses of shale as much as 0.3 m thick. The coaly layers are too thin and impure to be a potential fuel.

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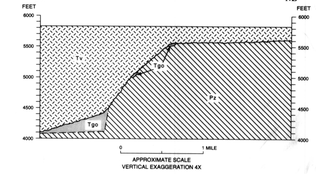

Figure 1. Diagrammatic section along Fossil Creek northeasterly from point about 1 mile west of dam showing relations of volcanic rocks [Tv] and older gravel [Tgo] to buried ancestral edge of the Colorado Plateau cut into Paleozoic strata [Pz]. Geology projected from north and south walls of canyon. Quaternary deposits and details of structure omitted.

PRELIMINARY GEOLOGIC MAP OF THE STRAWBERRY QUADRANGLE, YAVAPAI, GILA, AND COCONINO COUNTIES, ARIZONA

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