

RECENT FAULT SCARPS IN INDEPENDENCE VALLEY NEAR TUSCARORA, ELKO COUNTY, NEVADA

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Abstract.—In Independence Valley, near Tuscarora, Elko County, Nev., a system of northeast-trending faults cuts a late Quaternary gravel that veneers pediment surfaces cut on volcanic rocks of probable mid-Tertiary age. Some faults show erosionally degraded fault scarps up to 12 feet in height; the direction in which scarps face and the inferred direction of downthrow on the faults may be northwest or southeast, but most show the valleyward side downthrown. The faults are believed to be several hundred to several thousand years old. They have possible economic significance in prospecting for extensions of the gold-silver deposits of Tuscarora, or in the working of low-grade placers believed to exist in this district.

The purpose of this paper is to call attention to hitherto undescribed Recent fault scarps in a part of Nevada which displays little evidence of Recent faulting and to suggest the possible economic significance of the faulting, should mining be revived in this area.

Tuscarora is an old mining camp near the southwest corner of Independence Valley, an intermontane valley in western Elko County, Nev., (fig. 1) that is about 24 miles long and about 4 miles wide in the wider parts. The southern part of the valley trends northeast, and the northern part trends north. The slope of the eastern valley wall in the northern part is very steep and abrupt, and the outline is simple. The slope of the western side of the valley is much less abrupt, is more mature, and much of the west side of the valley is a broad pedimented fan. Tuscarora lies near the upper margin of the pediment surface.

CENOZOIC STRUCTURE

Little is known of the orientation of Cenozoic structures in the area. According to Nolan (1936, p. 22), most of the Tuscarora district is underlain by a bedded series of pyroclastic rocks intruded by irregular bodies of andesite. The bedded series dips generally southeast or east at angles of 15°–50°. It is cut by faults,

some of which are mineralized. The mineralized faults commonly have a northerly strike and a steep westerly dip, but one productive vein described by Nolan (1936, p. 30) has a northeasterly strike and a northwest dip. The general strike of the mineralized belt is northeasterly.

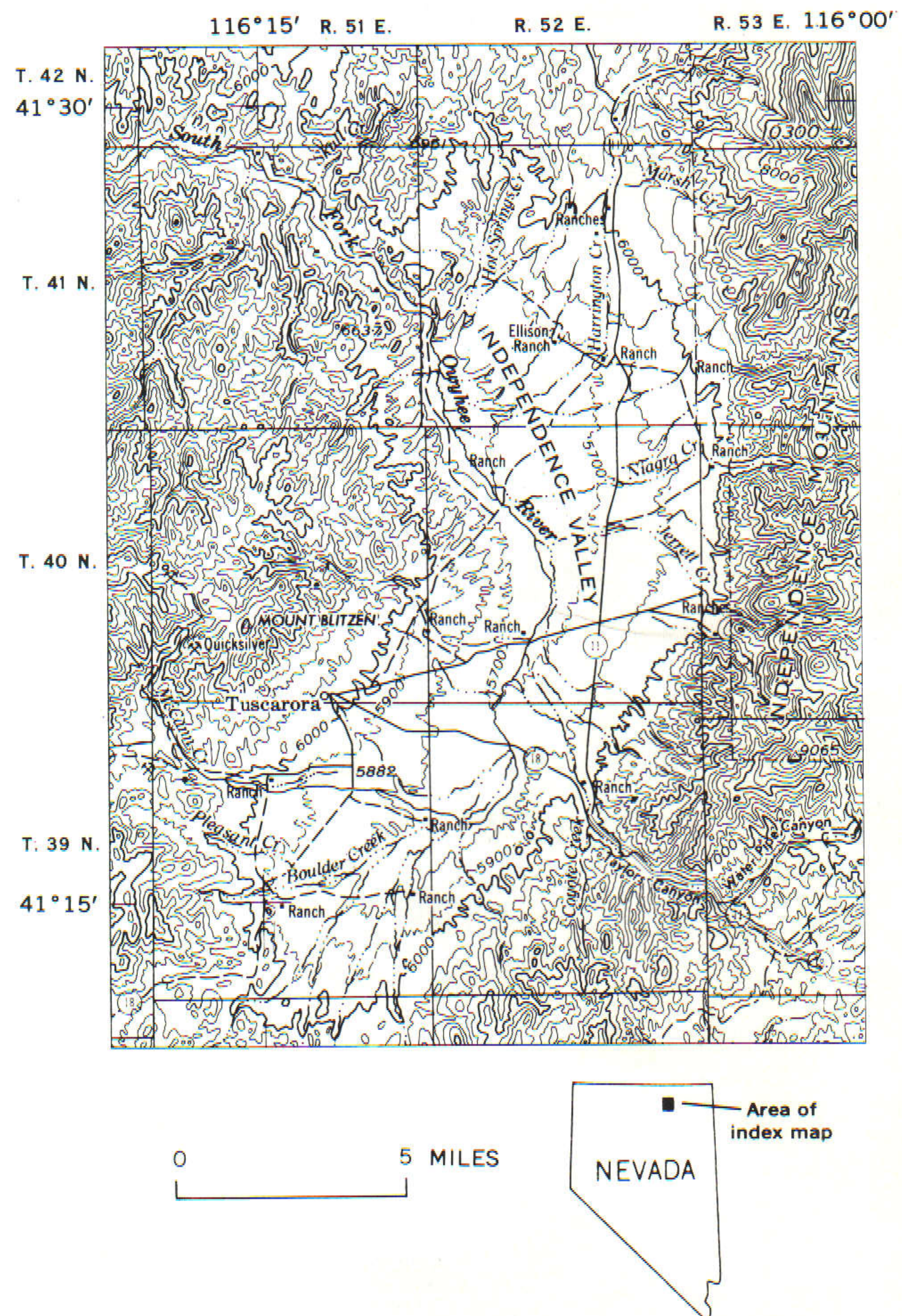


FIGURE 1.—Index map showing Tuscarora and Independence Valley, Nev.

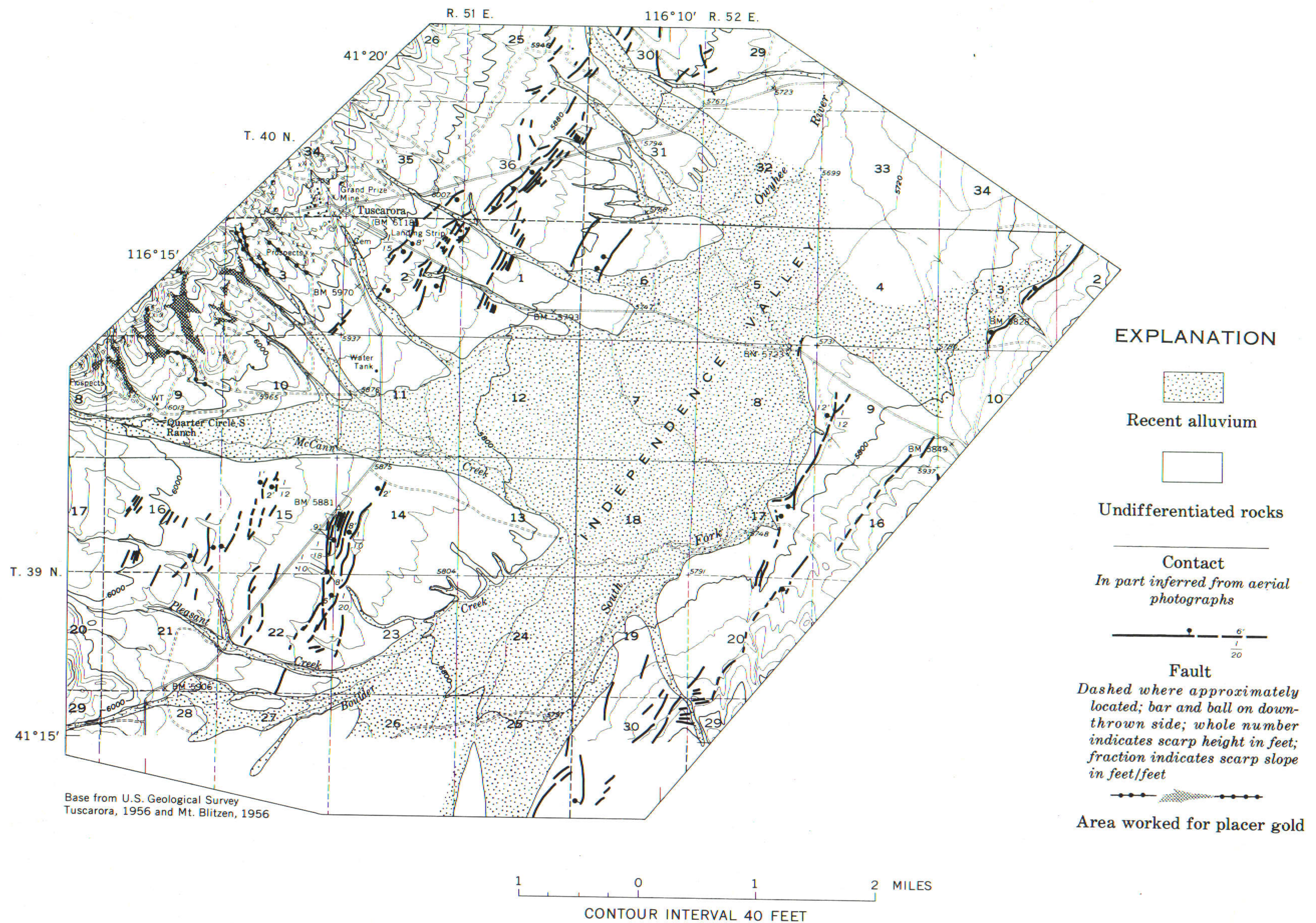


FIGURE 2.—Distribution of Recent faults near Tuscarora, Elko County, Nev., with respect to Recent alluvium and areas worked for placer gold.

In the Independence Mountains, the geology has been recently mapped by Kerr (1962) for a distance of several miles north of Taylor Canyon. Kerr has mapped numerous high-angle faults with northeasterly and northwesterly trends that cut the Tertiary rocks. Either the northwest or the southeast side of the northeast-trending faults may be downthrown; the southwest sides of the mapped northwestward-trending faults are downthrown.

On both sides of Independence Valley, gently sloping pediment surfaces lie between the steeper mountain fronts and the flat-lying alluvium of the present flood plains of the South Fork of the Owyhee River and its larger tributaries.

The sloping pediment surface on the northwest side of the valley is underlain by the Tertiary volcanic rocks that form the wallrocks of the mines of the Tuscarora district; it is overlain by a thin sheet of gravel that feathers out in the vicinity of Tuscarora, at about the 6,080-foot contour, and increases in thickness southward, as the bedrock surface has a slightly steeper slope than the upper surface of the gravel. Sediment and gravel covering are dissected by shallow streamways, some occupied by perennial streams, others by intermittent streams. Some of these streamways rise on the pediment, others in the higher hills to the northwest.

The area that was placer mined in the period subsequent to the discovery of placer gold in 1867 is indicated on figure 2. Part of the worked ground was alluvium in the valleys of the shallow streamways mentioned above, but much of the area worked was eluvial material or disintegrated bedrock below the outcrops of the lodes. As indicated on the map (fig. 2), the width of alluvium worked was at many places so small that it can be shown only as a line on the scale used here.

RECENT FAULTS

Examination of aerial photographs (taken for the U.S. Soil Conservation Service in 1949) disclosed swarms of linear features here interpreted as fault traces, mostly of northeasterly trend, on both sides of Independence Valley, between $41^{\circ}14' N.$ and $41^{\circ}20' N.$, and between $106^{\circ}06' W.$ and $106^{\circ}16' W.$ As shown in figure 3, there is a small difference between the mean trend of the faults on the northwest side of the valley, which has a pronounced frequency maximum at about $N. 30^{\circ} E.$, and the mean trend on the southeast side of the valley, where the maximum is at about $N. 35^{\circ} E.$

The faults, without exception, cut the dissected gravel surface that rests on the pediment and borders the flat Recent alluvial floor of Independence Valley. Some of the faults are marked on the ground by low

inconspicuous scarps that may face either northwest or southeast; there seems to be a slight predominance of scarps facing toward the valley.

The fault scarps range in height from 12 feet downward to imperceptible. The slopes of the scarps have been degraded by erosion; the steepest slope measured has a gradient of about 1 foot in 10. All the faults, including those that do not have perceptible scarps, are marked by lines of darker and more vigorous vegetation, mostly sagebrush (*Artemisia tridentata* Nuttall). These vegetational differences are conspicuous in aerial photographs, but very difficult to make out on the ground. The differences in plant growth are probably due to the effect of the faults on ground-water flow. The scarps are interrupted where they intersect the shallow gullies that furrow the pediment; the gully floors, which have widths measured in tens to hundreds of feet, pass smoothly across the fault traces without perceptible dislocation or change of grade. A few faults may be traced across the gullies by the vegetational contrast. In one place, drainage was evidently diverted from a shallow gully to an adjacent deeper one when a fault, with upthrow on the downstream side, cut both of them. The beheaded remnant of the shallower gully is a few feet shallower than gullies that extend with unchanged gradient across faults. I infer that in this place erosion has lowered the grade of the gullies several feet since the faulting.

AGE OF FAULTING

The intersection of the slightly elevated and eroded pediment gravels by the faults suggests that the age of the faults does not extend back into the Tertiary. Roads that cut the faults are completely undisturbed. No written record of local earthquake activity has been found, and inquiry made locally disclosed no oral tradition of local earthquakes. The preservation in Tuscarora of mud-mortared rock walls dating from the early years of the camp suggests that no major seismic activity has occurred within the past hundred years. I would suggest that the age of faulting falls between the limits of several hundred and several thousand years.

POSSIBLE ECONOMIC SIGNIFICANCE

Nolan (1936, p. 22) pointed out that the well defined faults seen in the few accessible mine workings trend north to north-northeast and dip steeply west. The little information available about the veins suggests similar attitudes. The ages of these faults are not precisely determinable. Emmons (1910, p. 58) regarded the volcanic rocks that are cut by the veins as Miocene. The earliest faulting and the mineralization would then be

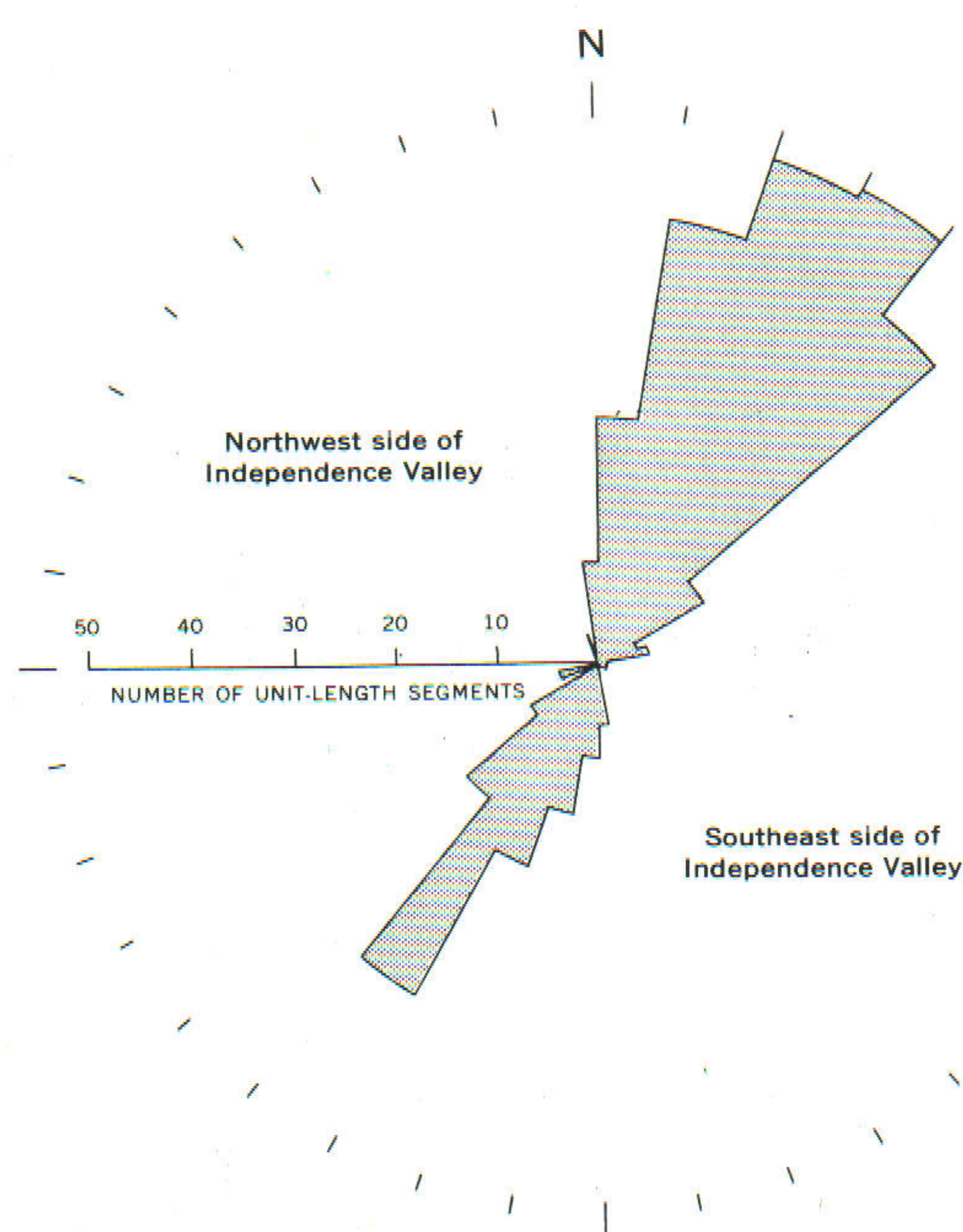


FIGURE 3.—Rose diagram showing distribution of orientations of Recent faults in the northwest (upper half of diagram) and southeast (lower half) sides of southern Independence Valley, Elko County, Nev. Measured in 400-foot segments; summed by 10° sectors.

post-Miocene and pre-Recent, probably pre-Quaternary. The area in which the Recent faults are traceable is southeast of the known mineralized area, but the correspondence in the trend of the earlier and Recent faults suggests that the strain field present in Recent time does not differ greatly from that present when the ore deposits were formed. The possible consequences of long-continued faulting on this pattern are numerous. They include shearing movements within the mineralized fissures and probable offset of ore shoots by gravity faults. Nolan (1936, p. 31) has indicated his reasons for believing that the bonanza silver

ores of Tuscarora were the result of supergene enrichment. If faulting in the mineralized area has continued into the Recent, the relation of the enriched zone to the present ground-water table will have been affected by the faulting, and the zone of supergene enrichment will probably lie at deeper levels closer to Independence Valley.

Emmons (1910, p. 62) and Nolan (1936, p. 35) suggest that the lower portions of the stream courses that have furnished the placer-gold production might be economically workable by dredging. As this is the area in which the Recent faults have been active, it is probable that any placer paystreaks in this area would be affected by the normal faulting, which is predominantly southeast side down, on the northwest side of Independence Valley. It would be expected that the gold would be distributed through a greater thickness of gravel on the downthrown side of the fault, or that multiple paystreaks at different levels would be present. Increase of stream gradients over restricted reaches in the vicinity of faults with decrease farther downstream may result in the shortening and enriching of paystreaks. It is impossible to predict all the possible vagaries of distribution of placer gold that may be affected by the faulting, but it is evident that prospecting of this area should be conducted with these possibilities in mind.

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