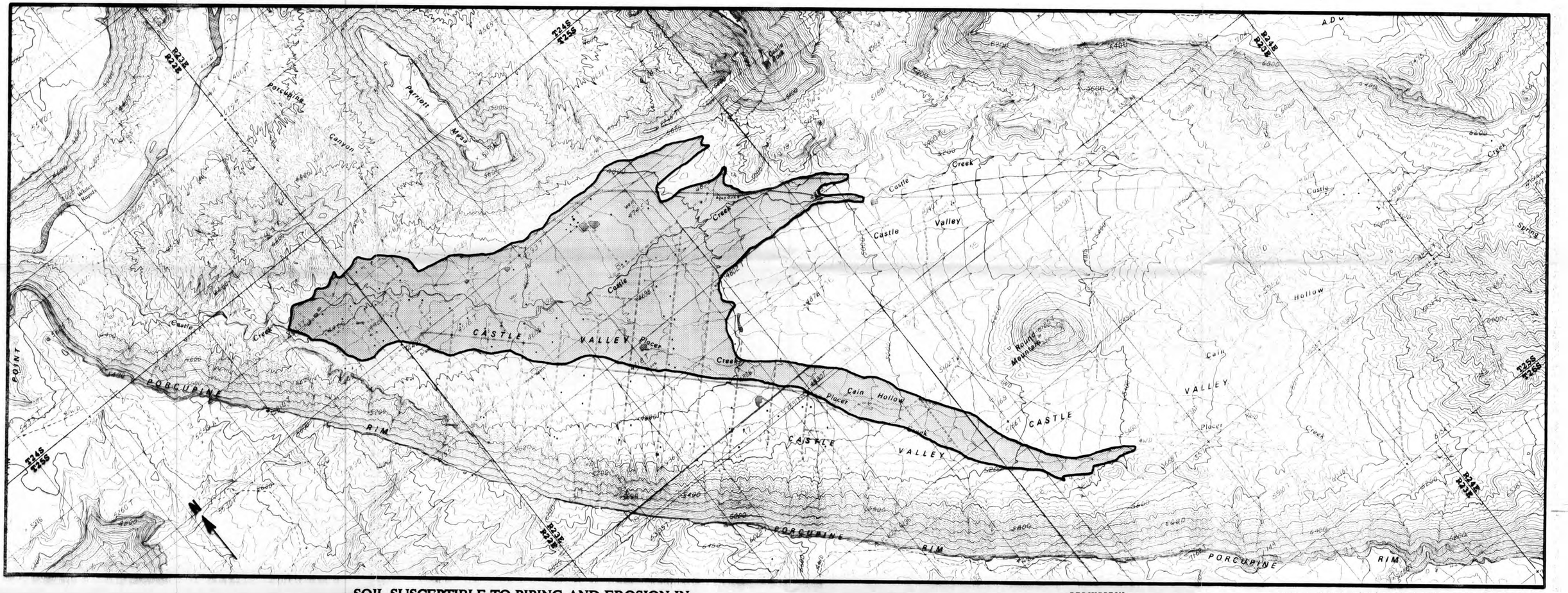


# SOIL SUSCEPTIBLE TO PIPING AND EROSION IN CASTLE VALLEY, GRAND COUNTY, UTAH

Utah Geological Survey
Open-File Report 238
Plate 4

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By

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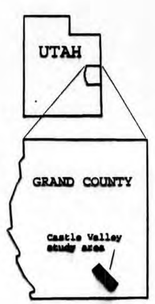


SCALE 1:24 000

1 ½ 0 1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 .5 0 1 KILOMETER

CONTOUR INTERVAL 40 FEET

Hazard map based on unpublished geologic mapping by M.L. Ross and H.H. Doelling.

Base map from USGS 1:24,000-scale topographic maps of Big Bend, Werner Lake, Fisher Towers, and Rill Creek.

**Explanation**

Soil susceptible to piping and erosion.

## DISCUSSION

Piping is subsurface erosion by ground water that moves along permeable, noncohesive layers in unconsolidated materials and exits at a cliff face that intersects the layer. Removal of fine-grained particles (silt and clay) by this process creates voids within the material that act as minute channels which direct the movement of water. As channels enlarge, water moving through the voids increases velocity and removes more material forming a "pipe". The pipe becomes a preferred avenue for ground-water drainage and enlarges as more water is intercepted. Increasing the size of the pipe removes support from the walls and roof, causing eventual collapse. Collapse features form on the surface above the pipes, directing even more surface water into the pipes. Eventually, total collapse forms a gully that concentrates erosion along the line of collapse features.

Piping is common in arid climates where fine-grained, uncemented Holocene-age (10,000 years ago to present) alluvium is incised by stream drainages. When enough water is introduced, water soaks into the subsurface until it reaches layers that can conduct the water to a free face. Types of material susceptible to piping that are found in Castle Valley are fine-grained alluvium (sand, silt, and clay) and fine-grained rock (siltstone, mudstone, and claystone).

The characteristics that make soil susceptible to piping also make them subject to rapid erosion. Erosion is the removal of material, particularly unconsolidated deposits by running water. In Castle Valley sheetwash erosion during cloudburst storms is common, as is vertical and lateral cutting of stream channels. During cloudbursts, sheetwash can affect talus slopes and alluvial fans.

Piping and erosion can damage roads, bridges, culverts, and structures. In Castle Valley, roads are most susceptible because they parallel and cross-cut incised drainages. Roads can contribute to piping and erosion by altering natural runoff and channeling water. Channelized water can increase infiltration and potential for pipes to develop, as well as erosion. Earthfill structures such as dams may also be susceptible to piping.

This hazard map shows areas where soil susceptible to piping and erosion may be found. The map is designed to show potential hazard areas for planning purposes only, and site-specific studies are needed to evaluate hazards and, if necessary, recommend hazard-reduction measures. The studies must be prepared by qualified professionals (engineering geologists, geotechnical engineers, hydrologists). Because of the relatively small scale of the maps (1:24,000), the possibility exists that some small hazard areas are not shown; studies are therefore recommended for critical facilities even outside the hazard areas.