

U.S. DEPARTMENT OF THE INTERIOR

U.S. GEOLOGICAL SURVEY

Slope map of the Telluride quadrangle,
San Miguel, Ouray, and San Juan Counties,
Colorado

by

Robert G. Luedke¹

Open-File Report 95-24

1995

This map is preliminary and has not been reviewed for conformity with U.S. Geological Survey editorial standards. Any use of trade, product, or firm names is for descriptive purposes only and does not constitute endorsement by the U.S. Government.

¹USGS, Reston, VA

Contents

	Page
Introduction.....	1
Method.....	1
Discussion.....	1
References cited.....	4

Figures

1. Index map showing location of the Telluride quadrangle in relationship to the San Juan volcanic field (shaded), southwestern Colorado.....	2
2. Diagram showing determination of slope in percentage.....	3
3. Diagram showing percent slope and angle of slope in degrees.....	3
4. Diagram showing spacing of contours for various percent slopes for maps at 1:24,000 scale and contour interval of 40 feet.....	3

Plate

1. Slope map of the Telluride quadrangle, San Miguel, Ouray, and San Juan Counties, Colorado (Explanation).....	6
---	---

Introduction

This slope map provides a general and quick reference guide to the varied terrain and slopes in the area around Telluride, western San Juan Mountains, Colorado (fig. 1). It is recommended that this map be used in conjunction with the geologic map of the quadrangle (Burbank and Luedke, 1966). The terrain ranges from virtually flat in the valley bottoms to very steep and locally vertical on valley and alpine basin walls. An understanding of the steepness of the land surface and how it affects, among other things, drainage and velocity of surface runoff, snow accumulation and avalanche (Luedke, 1976), slope stability (Luedke and Burbank, 1977), and ease of construction and access (Luedke and Burbank (1976), is of importance in proper land-use planning and development.

Method

The percent slope is derived by using the equation shown in figure 2, which is based upon the vertical change in altitude per 100 feet of horizontal distance and upon the spacing of contours, i.e., a contour interval of 40 feet for this 1:24,000 scale map. Figure 3 shows the relationship between the slopes in percent and in degrees of angle. In addition to the slope being expressed in percentage or in degrees, Schmoll and Dobrovolny (1971) also expressed the slope as a ratio equaling horizontal distance (h) to vertical distance (v), i.e., slope as a ratio = $h:v$, where v is equal to one unit of measurement. For example, in the ratio for a slope of 15 percent and an angle of about $8\frac{1}{2}$ degrees, the grade rises 1 foot in a horizontal distance of 7 feet (see Witkind, 1972). Figure 4 shows the spacing of contours for various percentage slopes for the 40-foot contour interval. Construction of this map was made to correspond to the contour spacings on the Telluride topographic base map in six land-slope categories: less than 5 percent, 5-15 percent, 15-30 percent, 30-60 percent, 60-100 percent, and greater than 100 percent.

Discussion

The first two categories include flat to gentle slopes of 15 percent and an angle less than about $8\frac{1}{2}$ degrees. Slopes less than 5 percent are found mainly on the alluvium in the San Miguel River valley. These virtually flat to very gentle slopes locally may have boggy spots because of the near-surface water table and poor surface drainage. Gentle slopes from 5 to 15 percent are formed commonly on alluvial fans at the river valley edge and on bedrock or thin alluvial-covered bedrock surfaces of upland benches and hillsides, particularly in the southwest part of the quadrangle. Few slope-related problems should be encountered in construction on these slopes, e.g., septic systems normally function better where slopes are less than 15 percent.



Figure 1.--Index map showing location of the Telluride quadrangle in relationship to the San Juan volcanic field (shaded), southwestern Colorado

$$\text{Percent slope} = \frac{v}{h} \times 100$$

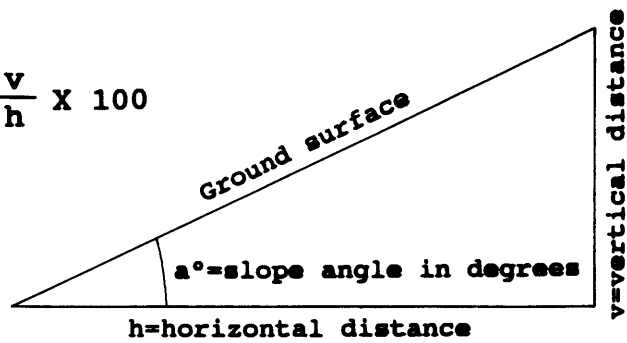


Figure 2.--Diagram showing determination of slope in percentage

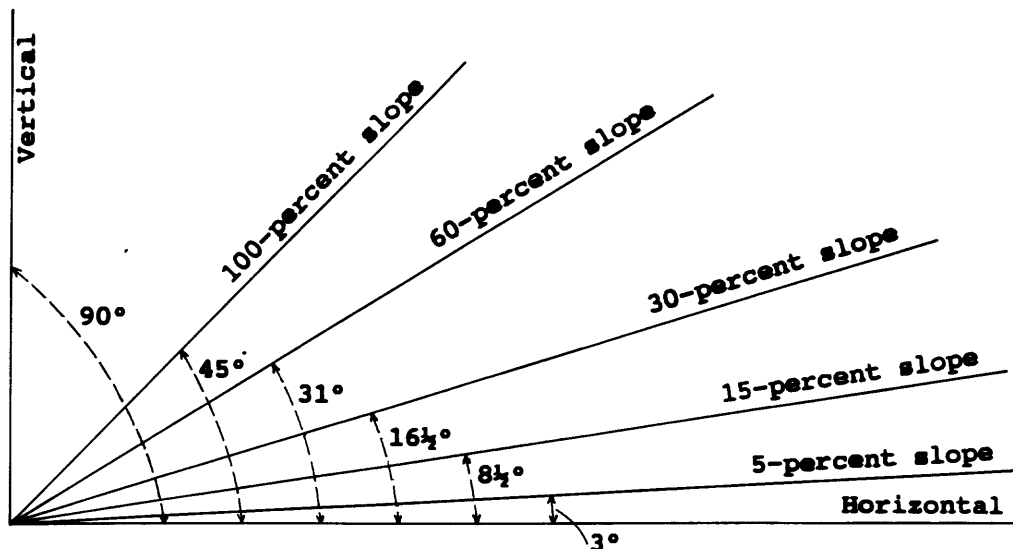


Figure 3.--Diagram showing percent slope and angle of slope in degrees

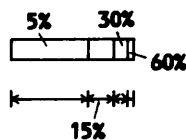


Figure 4.--Diagram showing spacing of contours for various percent slopes for maps at 1:24,000 scale and contour interval of 40 feet

Moderate slopes ranging from 15 to 30 percent are found mainly in the western part of the quadrangle both north and south of the river valley. These slopes are formed on soil-covered bedrock that consists both of sedimentary and volcanic rocks and surficial deposits that are subject to mass-wasting processes such as soil creep and landslide. Slopes in this percentage range usually are densely covered with timber. The specific locality and bedrock or surficial materials (see Burbank and Luedke, 1966; Luedke and Burbank, 1976) will determine the difficulty to be encountered in construction.

Slopes ranging from 30 to 60 percent flank many of the upland ridges and small valleys north and south of the San Miguel River valley in the western part of the quadrangle, and flank many of the alpine basins in the northern and eastern parts of the quadrangle. These slopes are developed on a variety of soil-covered, and often densely timber-covered, bedrock materials. Considerable care and planning are needed with respect to any development and construction on these steep slopes.

Steep to very steep slopes, ranging from 60 to 100 percent, comprise much of the Telluride quadrangle. Many of these slopes along the San Miguel River valley, Bear Creek valley, and in the upland mountainous terrain are exposed bedrock or only thinly mantled by loose rock and soil. Below timber line, at about 11,500 feet, the slopes are also locally covered by dense stands of timber. Development on these slopes requires special planning because of slope steepness and inherent construction difficulties, and is generally impractical.

Slopes steeper than 100 percent (45 degrees) are usually bare bedrock, and present extremely difficult construction problems. Such slopes are prevalent throughout the quadrangle.

References cited

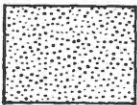


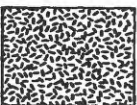
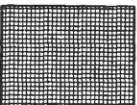

- Burbank, W.S., and Luedke, R.G., 1966, Geologic map of the Telluride quadrangle, southwestern Colorado: U.S. Geological Survey Geologic Quadrangle Map GQ-504, scale 1:24,000.
- Luedke, R.G., 1976, Map showing potential snow avalanche areas in the Telluride quadrangle, San Miguel, Ouray, and San Juan Counties, Colorado: U.S. Geological Survey Miscellaneous Field Studies Map MF-819, scale 1:24,000.
- Luedke, R.G., and Burbank, W.S., 1976, Map showing types of bedrock and surficial deposits in the Telluride quadrangle, San Miguel, Ouray, and San Juan Counties, Colorado: U.S. Geological Survey Miscellaneous Investigations Series Map I-973-A, scale 1:24,000.

____ 1977, Map showing potential geologic hazards in the Telluride quadrangle, San Miguel, Ouray, and San Juan Counties, Colorado: U.S. Geological Survey Miscellaneous Investigations Series Map I-973-B, scale 1:24,000.

Schmoll, H.R., and Dobrovolsky, Ernest, 1971, Generalized slope map of the Eagle River-Birchwood area, Greater Anchorage Area Borough, Alaska: U.S. Geological Survey Open-File Report, scale 1:63,360.

Witkind, I.J., 1972. Generalized slope map of the Henrys Lake quadrangle, Idaho and Montana: U.S. Geological Survey Miscellaneous Geologic Investigations Map I-781-B, scale 1:62,500.

EXPLANATION

PERCENT SLOPE		ANGLE OF SLOPE
 Less than 5	}	0° to 3°
 5-15	}	3° to 8½°
 15-30	}	8½° to 16½°
 30-60	}	16½° to 31°
 60-100	}	31° to 45°
 Greater than 100	}	45° to 90°