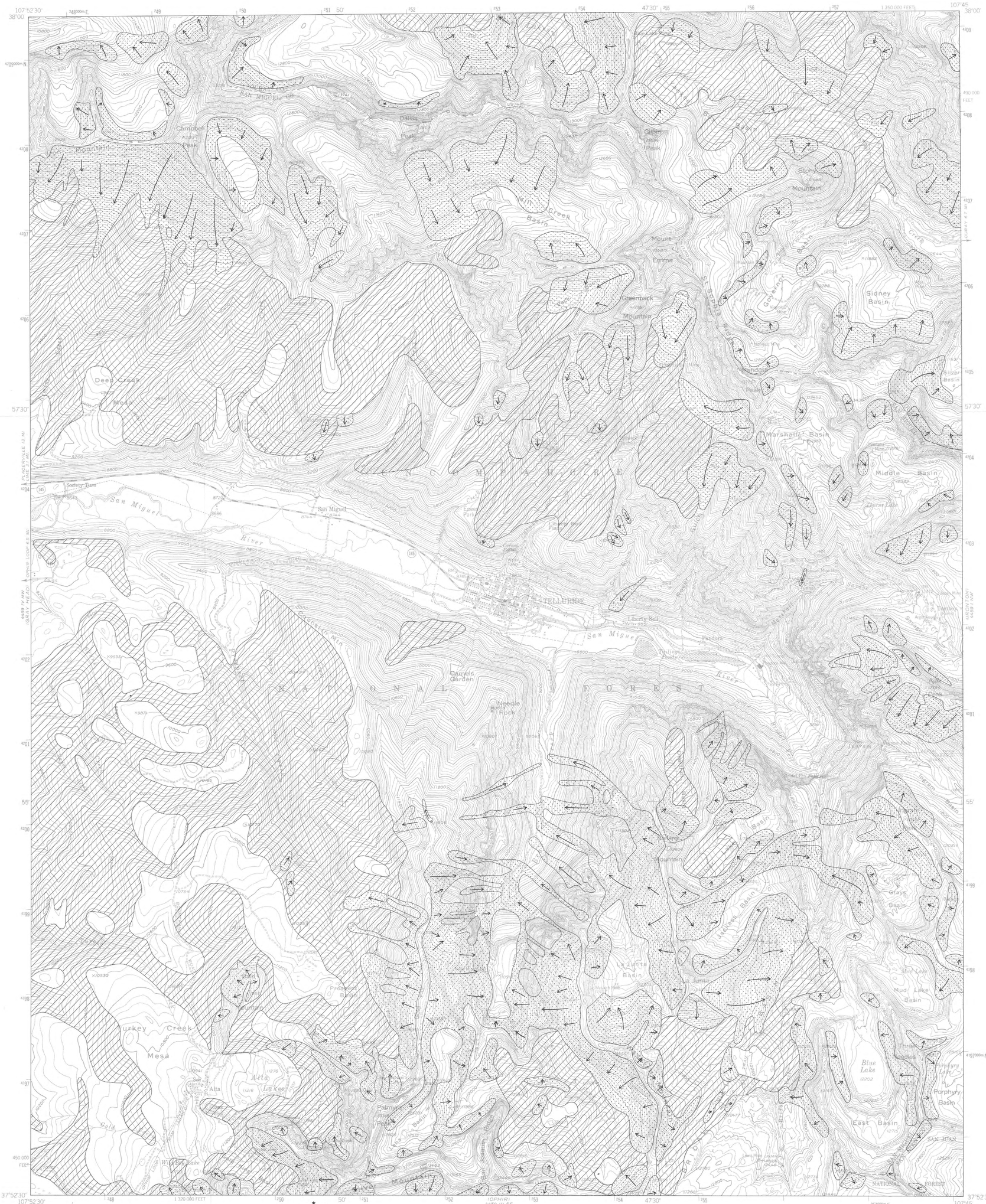
DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY

MISCELLANEOUS FIELD STUDIES
MAP MF-819
LUEDKE– SNOW AVALANCHE.
TELLURIDE QUAD.,COLO.



MAP SHOWING POTENTIAL SNOW AVALANCHE AREAS IN THE TELLURIDE QUADRANGLE, SAN MIGUEL, OURAY, AND SAN JUAN COUNTIES, COLORADO

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EXPLANATION

Areas of snow accumulation that under certain slope, snow, and weather conditions could become unstable and subject to potential snow avalanche

Maximum avalanche hazard--Arrows indicate direction of known and probable avalanche movement

Moderate to minimum avalanche hazard

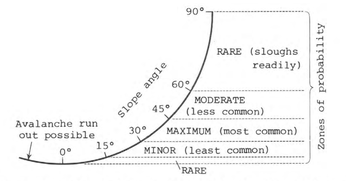

Figure 1.--Relationship of slope angle to snow avalanche release probability zones (modified from Witkind, 1974)

DISCUSSION

Snow avalanches rank with landslides, floods, earthquakes, and volcanic eruptions as one of the most destructive forces of nature. In parts of the San Juan Mountains region of southwestern Colorado, snow avalanches are a serious winter hazard. The Telluride area, in particular, has been the setting for many snow avalanches that sometimes have resulted in loss of property and life..

Because the American Indians seldom penetrated the mountains during the winter, snow avalanches were relatively unimportant before the prospectors and miners entered this area almost a century ago. The snow avalanche then became a real hazard. Early geologic and mining reports on the area often mentioned rigorous winters with huge accumulations of snow and frequent snow avalanches. Many mine buildings were threatened each winter by sliding snow; those hit were sometimes seriously damaged. In February 1902, for example, three snowslides in one day destroyed the upper buildings at the Liberty Bell mine, killing 18 men. In recent decades avalanche damage diminished with declining mining activities, as the alpine area was much less frequented during the winter. Now, however, the development of winter recreational facilities again exposes more people to the hazard of snow avalanches.

The alpine Telluride area has all of the basic requirements for snow avalanches: frequent storms, heavy snowfall, large snow accumulation, the winter mix of warm and cold days, and steep slopes. In addition to these requirements, the probability of snow avalanching increases or decreases depending upon factors such as slope angle, slope orientation, prevailing wind direction, and vegetative cover on the slopes. Although grossly oversimplified, the continuing discussion points out the significance of these factors in relation to the winter snowslide hazard.

Avalanches are most common on slopes of 30° (60 percent) to 45° (100 percent). Avalanches are possible on gentler or steeper slopes, but the probability decreases as the slope nears vertical or horizontal (fig. 1); avalanches have originated on slopes as gentle as 15° (27 percent) and as steep as 60° (175 percent). Snow on slopes steeper than 60° sloughs readily and usually does not accumulate in quantities needed for avalanching.

Slope orientation is also closely related to avalanche development. North-facing slopes receive little direct sunlight; consequently the snow there is drier because of little melting. Lacking internal cohesion, this dry snow that does accumulate, often in lesser amounts, tends to avalanche earlier in the winter. Conversely, snow on south-facing slopes receives more direct sunlight, and thus more heat, with resultant melting, settling, and internal changes; this wetter snow tends to avalanche in the late winter and early spring with warming weather.

Wind, which in the Telluride area is generally from the west, locally affects snow avalanche development. It keeps snow from accumulating to any great amount on the windward slopes and compacts the existing snow, thereby lessening the chances of an avalanche. Conversely, wind helps to accumulate more snow on the leeward slopes by deposition during storms and by drifting during both stormy and fair weather. The wind likewise builds snow cornices on the leeward sides of ridges and peaks which, if broken off, can trigger avalanches below.

Heavily wooded slopes hold snow the best, open grassy slopes the worst. A rocky or brush-covered slope stabilizes snow until it is filled in and smoothed over. Much of the area westward from the vicinity of Telluride and on both sides of the river valley is heavily wooded. The timber-covered slope, however, does not necessarily afford protection against snow avalanches originating above timber line, here about 11,500 feet (3505 meters). Vertical swaths through the timber generally are avalanche tracks; bent and broken trees nearby are indicative of former avalanches. Gullies, also, are natural and obvious avalanche paths. Avalanches tend to follow the same paths year after year, but they may modify the paths or establish new ones. Small openings or clearings in steep wooded slopes are dangerous avalanche sites under certain snow and temperature conditions, as demonstrated in the nearby Aspen Mountain ski area (Bryant, 1972).

This avalanche hazard map was compiled from information shown on aerial photographs, the topographic map, records, and reports. Two categories of avalanche hazards are delineated on the map. The areas of *maximum avalanche hazard* are, for the most part, above timber line but include some clearings and probable avalanche paths in the lower wooded slopes. These areas have slopes commonly between 30° and 45° (60 and 100 percent), but they locally include some gentler and (or) steeper intervening slopes. The areas of *moderate to minimum avalanche hazard* are, for the most part, timbered slopes north and south of the river valley with scattered clearings; these areas have slopes commonly between 15° and 30° and between 45° and 60°. The Telluride winter sports area is mostly within the wooded slopes southwest of town. Only the west slopes of Gold Hill, parts of Prospect Basin, and north slopes of Palmyra Peak at the south end of the sports area appear to need continual surveillance during the winter season. Snow, weather, and avalanche conditions for the sports area are available through the Forest Service, Telluride community, and sports area ski patrol. The winter traveler elsewhere in the Telluride mountainous area should be aware of the possible avalanche localities, be alert to snow and weather conditions, and know the necessary safety and survival rules in snow avalanche country. Perhaps from the standpoint of overall safety, few places within the Telluride area should be considered as absolutely safe from avalanche hazards.

The snow avalanche hazard can be minimized for the winter traveler who knows and follows a few basic safety rules. First and foremost, avoid known and probable avalanche areas by selecting good routes. The safest routes are along the windward side of ridges, away from snow cornices, and in the middle of wide valley bottoms. Many of the valleys and high mountain basins in the Telluride area are small and narrow, however, so that locally even the middle of valley bottoms may be subject to snow avalanches or avalanche run out. Exercise caution in these areas at all times, and avoid them particularly during or just after snow storms. When below timber line, keep to wooded or rocky areas and avoid traversing large or small clearings and crossing steep open gullies. If it is necessary to cross a dangerous slope, only one person should cross at a time.

Finally, one cardinal rule: never travel alone in snow avalanche country. Always travel with a party that observes the proper precautions and that carries and knows how to use the necessary survival equipment (avalanche cord, sectional probe). The obvious advantage of traveling in a group is that if one should unfortunately be caught in an avalanche, the others can immediately start the search. Time is of the essence; the survivors are the victim's best hope for survival.

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