

PLATE B-1

**MAP SHOWING DRAINAGE AND WATERSHEDS
OF THE FOREST FALLS AREA,
SAN BERNARDINO COUNTY, CALIFORNIA**

**ROCKFALL AND STREAM-RELATED DEBRIS-FLOW HAZARDS OF THE
FOREST FALLS AREA, SAN BERNARDINO COUNTY, CALIFORNIA**

Landslide Hazard Identification Map No. 43

by

Siang S. Tan and Desmond G. Giffen

1995

EXPLANATION

Introduction

Plate B-1 identifies areas in Forest Falls susceptible to stream-related (overbank) debris flow. The term stream-related debris flow is used to distinguish this phenomenon from the more traditional slope-related debris flow, mudflow, or debris avalanche. A stream-related debris flow is a rapidly moving fluid mass of mud, rocks, and vegetation including tree trunks and root masses. Stream-related debris flows lie beyond the end of the spectrum of flood activity, which ranges from clearwater floods to slope-related debris flows and mudflows. Slope-related debris flows, because they contain a high proportion of solid material, are rapid failure forms of mass movement rather than true flood phenomena. Landslide (slope-related hazard) susceptibility for this area was mapped by Tan (1990).

Historical Notes

Over the past 60 years, heavy winter and summer thunderstorms have periodically damaged the community of Forest Falls.

Substantial winter storms in 1938, 1965, and 1966 caused considerable damage to roads, bridges, and private property. In 1965, 16 houses were destroyed, four of which were on "slide" in the Mill Creek drainage course. The Valley of the Falls highway bridge spanning Mill Creek in the community was also destroyed. Snow Creek overbanked in 1965 and 1966 resulting in portions of Valley of the Falls Drive being covered by more than 5 feet of mud and boulders.

Summer storms in 1955, 1958, 1961, 1963, 1984, and 1989 also caused damage due to stream-related debris flows and overbank flooding from creeks. Overbanking along Snow Creek in 1961, 1963, and 1984 resulted in the closure of portions of Valley of the Falls Drive. In 1989 a house on the "slide" was seriously damaged when Mill Creek overtopped a 15-foot bank and destroyed a 10-foot stone wall.

In order to alleviate some of these problems, some drainage courses within the Forest Falls area were modified in the late 1960s. Berms and levees were constructed at channels, deepened and widened. However, these attempts were not wholly successful as subsequent summer storms in 1984 and 1989 caused stream-related debris flows in the area, especially along or near Snow and Mill creeks.

Methods

The study included field work and analysis of aerial photographs and topographic maps in an effort to map and plot significant drainage courses in the Forest Falls residential area.

For this study, drainage courses were subdivided into three categories: Type A (Major), Type B (Intermediate), and Type C (Minor). The only Type A drainage course in the study area is Mill Creek, which empties a watershed of approximately 20,000 acres (80 sq. mi.). It is the largest and most hazardous drainage course in the Forest Falls area. Stream Type B drainage courses were mapped. Each of these intermediate drainage courses empties a watershed of at least 65 acres (0.1 sq. mi.). Type C drainage courses are much smaller and they drain watersheds less than 65 acres (0.1 sq. mi.).

Boundaries for watersheds south of Forest Falls were mapped from the topographic base map and range from 80 acres (0.12 sq. mi.) to 580 acres (0.80 sq. mi.). The terrain within these watersheds is extremely steep, with relief up to 5,000 feet. During thunderstorms runoff from steep watersheds empties via Type B drainage courses through Forest Falls. It is the ability of the Type A and B drainage courses to empty these watersheds rapidly during peak storms that controls much of the potential hazard of stream-related debris flows throughout the study area. Therefore, it is necessary to maintain these drainage courses and keep them free of debris and reduce stream-related debris flow hazards. During storms Type C drainage courses carry some runoff but not the high volume as Type B drainage courses, and are not considered hazardous. In July 1984, a boulder blocked a drainage course during a thunderstorm. This resulted in runoff creating a new course toward Mill Creek, sending several feet of mud across Valley of the Falls Drive.

Acknowledgments

We would like to acknowledge the contributions and guidance of Allan G. Barrows (Division of Mines and Geology) during the preparation of this report and also Wendy A. Roeder (San Bernardino County Geologist) for assisting this study and providing advice.

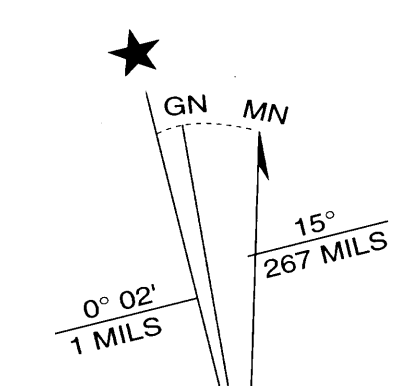
Geologic References

- Dibble, T.W., Jr., 1964. Geologic map of the San Geronimo Mountain Quadrangle, San Bernardino and Riverside counties, California: U.S. Geological Survey Miscellaneous Geologic Investigation Map G-431, scale 1:62,500.
- Matt, J.C., Cox, R.E., and Irwin, S.R., 1983. Mineral resource potential map of Raymond Flat watershed area, San Bernardino and Riverside counties, California: U.S. Geological Survey Miscellaneous Field Studies Map MF-1583-A, scale 1:62,500.
- Roeder, W.A., 1990. Preliminary geologic hazard assessment, community of Forest Home, San Bernardino County, California. Gary S. Rosenbauer & Associates, Inc., unpublished report, scale 1:24,000.
- Tan, S.S., 1990. Landslide hazards in the Yucaipa and Forest Falls quadrangles, San Bernardino County, California: California Division of Mines and Geology Open-File Report 90-5, scale 1:24,000.

NOTE: This is an Official Seismic Hazard Zone Map under the provisions of Chapter 7.8 of the California Public Resources Code.

SYMBOLS

- Type A: Major Drainage Course**
(Mill Creek) Empties watershed of approximately 20,000 acres (80 sq. mi.)
- Type B: Intermediate Drainage Course**
Empties watershed greater than 65 acres (0.1 sq. mi.) but fewer than 650 acres (1 sq. mi.). Dashed where course follows road. Type B drainage courses have been modified in places; berms/levees were constructed and the channels deepened and widened.
- Type C: Minor Drainage Course**
Empties watershed fewer than 65 acres (0.1 sq. mi.). Dashed where inferred, dotted where course follows road. Not mapped north of Mill Creek.
- Drainage Course Beyond Study Area:**
Tributary or continuation of Type B drainage course outside boundaries of study area. These courses empty watersheds described below.
- Watershed Boundary:**
Boundary of watershed that drains into a Type B drainage course within the study area. Boundaries were mapped from the topographic base map. Approximate acreage is included within boundaries.



INDEX MAP

