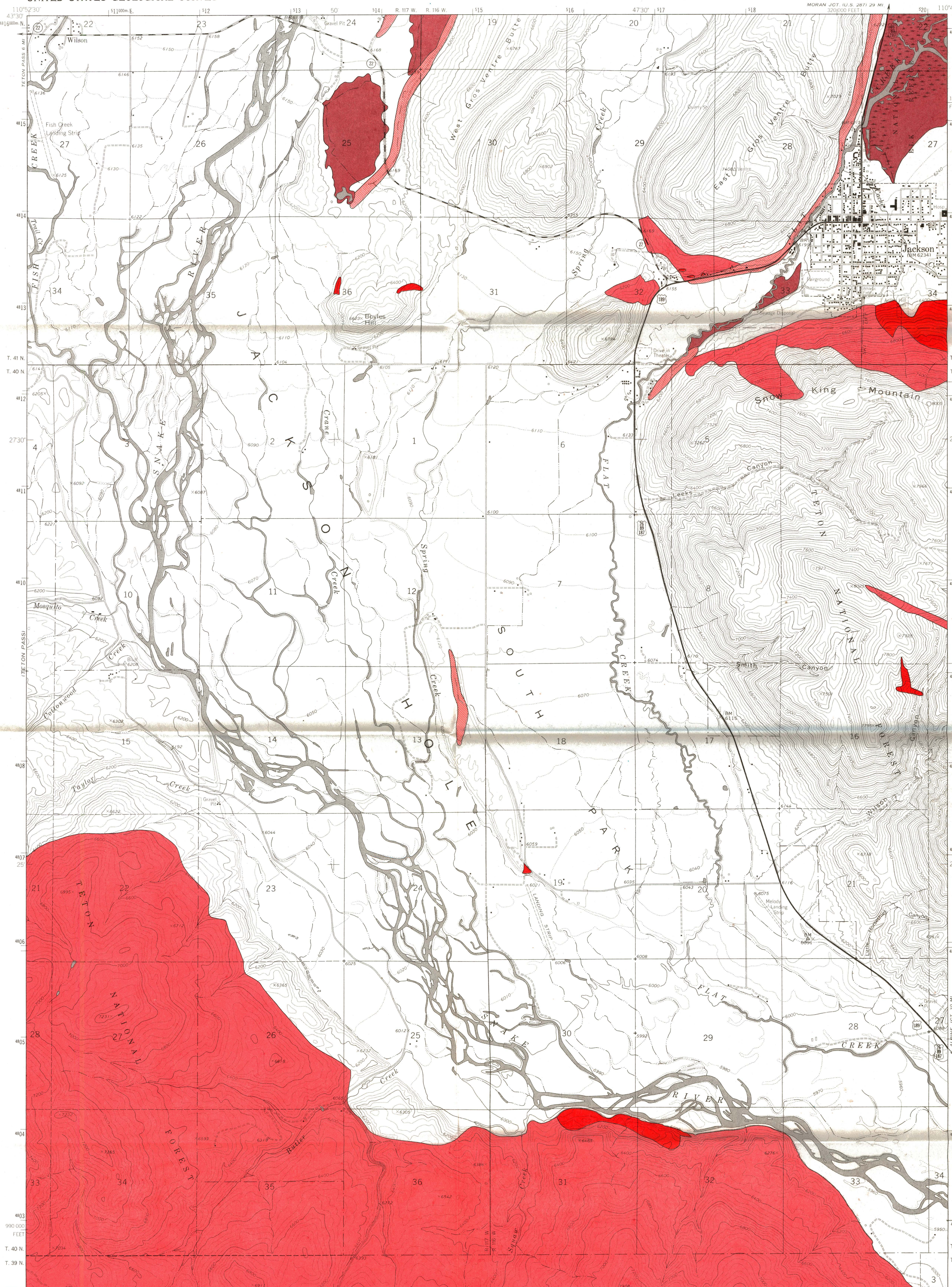
DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY

FOLIO OF THE
JACKSON QUADRANGLE, WYOMING
MAP I-769-F



Base from U.S. Geological Survey, 1963
10,000-foot grid based on Wyoming coordinate system, west zone
1000-meter Universal Transverse Mercator grid, zone 12

TRUE NORTH
MAGNETIC NORTH
16½°
APPROXIMATE MEAN DECLINATION, 1973

SCALE 1:24 000
1 ½ 0 1 MILE
1 .5 0 1 KILOMETER
CONTOUR INTERVAL 40 FEET
DOTTED LINES REPRESENT 10-FOOT CONTOURS
DATUM IS MEAN SEA LEVEL

WYOMING
QUADRANGLE LOCATION

INTERIOR—GEOLOGICAL SURVEY, WASHINGTON, D.C.—1973—G73202

MAP SHOWING DIFFERENCES IN THE STABILITY OF THE GROUND, JACKSON QUADRANGLE, TETON COUNTY, WYOMING

By
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1973

EXPLANATION

PRESENTLY STABLE GROUND – Flat areas are underlain by unconsolidated alluvial deposits, chiefly gravel; hills consist mostly of hard bedrock that contains little clay. Few high cliffs are present and rockfalls are uncommon. There is no evidence of faulting in the last 12,000 years

UNSTABLE GROUND – Areas underlain by unstable deposits which show evidence of downslope movement

GROUND WITH VARIABLE STABILITY – Rocks and soils contain much unevenly distributed plastic clay and variable amounts of water. Degree of stability depends on local conditions

SWAMPS – The wet ground in and adjacent to these areas would probably shake violently during an earthquake

AREA ALONG RECENT AND ALMOST-RECENT FAULTS – The ground surface here has been ruptured along a fault, and this movement probably accompanied earthquakes. Most of this faulting occurred during the last 12,000 years. Repeated movement commonly occurs along lines of weakness of this type

DISCUSSION

In many parts of the Jackson quadrangle, areas of ground that show evidence of being unstable are not likely to affect man's activities. Other unstable areas, however, present hazards that should be recognized. Buildings and roads on and directly downhill from these areas may be tilted and pulled apart; some may be destroyed by masses of rock and earth that might slide from the slope uphill. The speed by which such destruction may be accomplished would depend on whether an earthquake shock were involved and whether the ground were dry or very wet (wet ground is much less stable). If no earthquake were involved, sliding could still be caused by normal pull from the earth's gravity on water-saturated ground. One area of immediate and major environmental concern is an old and partly stabilized landslide within the southeast part of the town of Jackson (annexed in 1970, so is not shown in the town limits on the topographic map). It can be recognized by its lumpy bulbous surface studded with rock slabs. The slide extends across the cemetery and to the east beyond the quadrangle boundary. The surface of this landslide has an average slope of 30 percent and is flatter on the lower slopes and steeper (more than 50 percent) on the upper (see Love, 1973). Road and house excavations, and shallow wells drilled for water within and directly east of this part of the quadrangle, show that the slide debris consists of soft plastic clay interspersed with broken masses of sandstone and some large limestone slabs that have skidded down from high up on the steep slopes to the south. In parts of the slide area, the lower 10 feet of old living trees curve uphill into the slope, indicating that as the ground moved the trees were tilted and, as they grew, had to bend upward in order to return to a vertical position. Tilted trees are common in areas of slow earth movements. The unstable debris poses a construction problem that, over a period of years, may become very expensive in terms of repairing or replacing roads and buildings. (See discussion accompanying Love, 1973).

Areas shown as "Ground with variable stability" are those in which rocks and soils contain a considerable amount of unevenly distributed plastic clay that slides easily, where slopes range from steep to moderate, and where the water content ranges from high to low as a result of differential porosity, permeability, and location of thick and thin snowpacks. Most of the slopes face north, and the snowpack tends to be thick but irregular. Layers of bedrock may be unstable where their bedding planes, on which sliding occurs most easily, dip nearly parallel to the ground slope. The same rock units may be stable, however, where the beds dip into the hill and breakage would have to occur across rather than along the layers.

Northeast of the junction of State Highway 22 and U.S. Highway 189, on the steep south face of East Gros Ventre Butte, homesites cut into the slopes expose a considerable thickness of soft plastic clay. This clay, now that it has been exposed, disturbed, and thus more easily susceptible to water saturation, may cause some future stability problems, partly because of its plastic nature and exposure on the steep slope, and partly because of its nearness to a large fault at the base of the butte. If the ground here were wet and buildings heavy, an earthquake might cause a significant amount of sliding.

Several large and small swampy areas are shown in the northern part of the quadrangle. An earthquake of even moderate intensity anywhere in the region probably would cause these local areas, which are saturated with water, to shake like jelly, and this would cause considerable damage to buildings and roads. Parts of the swampy areas north and west of Jackson presently are being filled with broken rock, and buildings are planned or are being constructed on these fills. In places where the swamp deposits are not entirely removed down to a solid gravel base and replaced by broken rock, or where pilings are not sunk to a stable layer below the swamp debris, buildings might be vulnerable to considerable earthquake damage unless they are constructed to earthquake-resistant specifications. Swampy areas also pose problems of differential settling beneath heavy buildings.

Swampy areas too small to be shown on the map are abundant along Spring Creek, Flat Creek, and abandoned channelways of the Snake River. Most of these areas probably are underlain by gravel at a shallow depth, but drilling or excavation and drainage are needed to determine the desirability of erecting buildings here.

The swampy area along Flat Creek, near the west margin of the town of Jackson, is caused in part by drainage of water from the downstream margin of the Cache Creek fan deposits (Love, 1972). The northern part of this swamp has been filled in with crushed rock to create building sites. If differential settling of buildings in this area is to be avoided, foundations need to be adequately supported. In addition, buildings here and in adjacent localities should be designed to withstand earthquakes, not only because of the effects of shocks transmitted through (and perhaps intensified by) the swamp, but also because the area is directly adjacent to several faults that have been active in the last 12,000 years (see purple areas on map). Movement along these faults (in places 10 to 50 feet or more) must have been accompanied by major earthquakes. In comparison, faults that moved during the earthquake of 1959 near West Yellowstone, Montana, 90 miles north of Jackson, had 20 feet maximum displacement. That earthquake, which was distinctly felt in the Jackson area, took 28 lives, caused major landslides (one of which dammed a large river), and destroyed many roads and much property. Evidence for the age of faulting and amount of movement in and north of the Jackson quadrangle has been described by Love and Taylor (1962).

Earthquake shocks of various intensities have been felt from time to time in the quadrangle area. The most severe was on Feb. 23, 1948, and had an intensity of VI on the modified Mercalli scale of 1931 (Definition of intensity VI by U.S. Coast and Geodetic Survey: "Felt by all; many frightened and run outdoors. Some heavy furniture moved; a few instances of fallen plaster or damaged chimneys. Damage slight"). In the towns of Jackson and Wilson, the effect on the populace and property fits this description. Some of the lesser shocks (the list is far from complete) felt within the last 50 years occurred in 1925, 1928, 1932, 1959, 1968, 1970, and 1972. Prior to 1925, the records become progressively more scanty, and are generally word-of-mouth reports from pioneer residents.

On the basis of the long geologic record of crustal disturbances, and the more recent human observations of earthquake shocks in the Jackson quadrangle, it would seem logical for prospective builders to get appropriate architectural guidance in the design and construction of all major projects.

Prediction of when earthquakes might occur and where new faults will break the ground surface cannot be made on the basis of our present knowledge. All we can do is be guided by where and when they have occurred in the past. The outlines on the map that show known areas of geologically recent and almost-recent faulting should not carry the implication that places beyond these boundaries will be completely free of earthquake shocks and faulting.

REFERENCES

Love, J. D., 1972, Geologic map of the Jackson quadrangle, Teton County, Wyoming: U.S. Geol. Survey Misc. Geol. Inv. Map I-769-A. 1972.

________1973, Map showing steepness of slopes in the Jackson quadrangle, Teton County, Wyoming: U.S. Geol. Survey Misc. Geol. Inv. Map I-769-E.

Love, J. D., and Taylor, D. W., 1962, Faulted Pleistocene strata near Jackson, northwestern Wyoming, *in* Geological Survey Research 1962: U.S. Geol. Survey Prof. Paper 450-D, p. D136-D139.