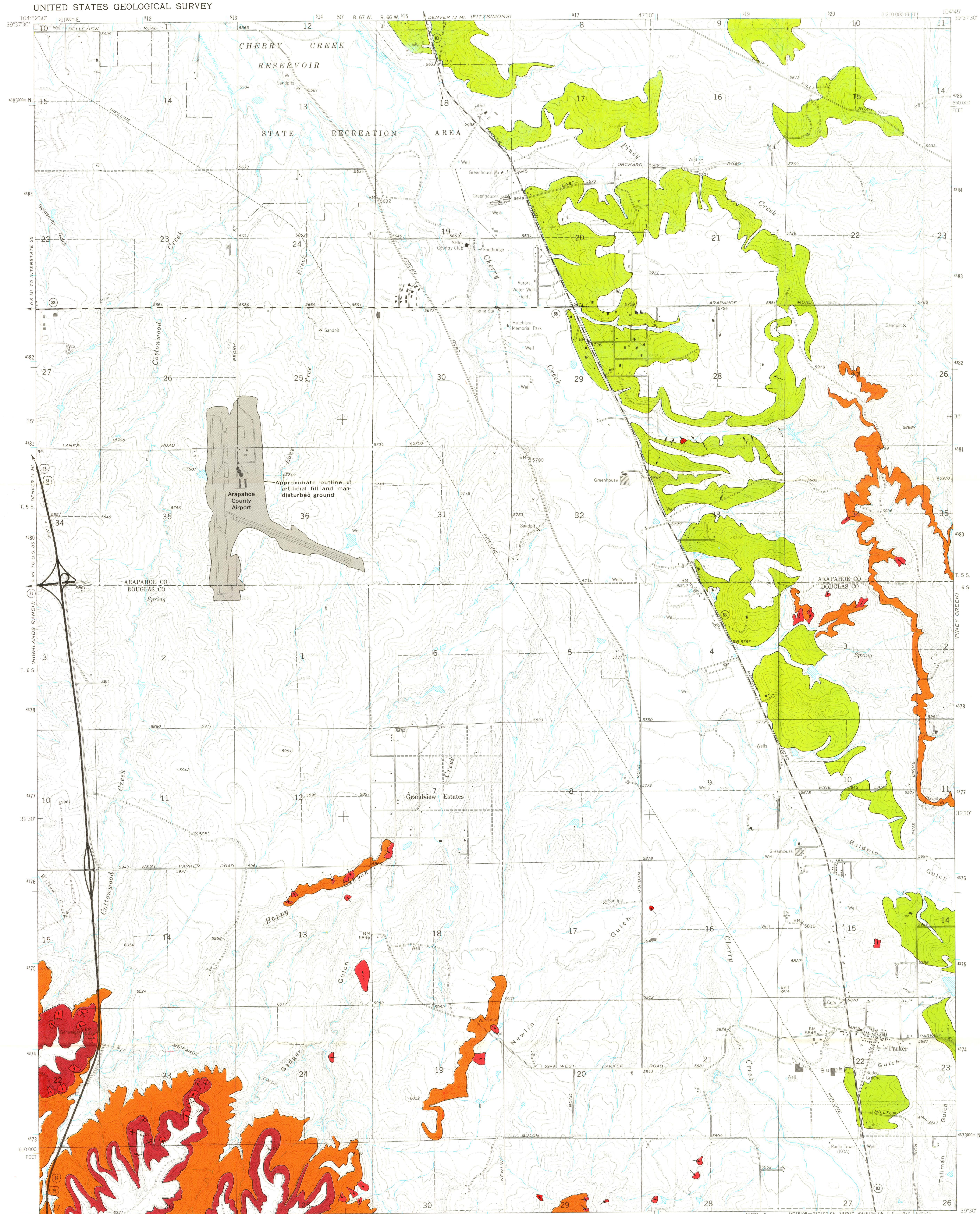
DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY

FOLIO OF THE
PARKER QUADRANGLE, COLORADO
MAP I-770-E



Base from U.S. Geological Survey, 1965
Photorevised in 1972
10,000-foot grid based on Colorado coordinate, system, central zone
1000-meter Universal Transverse Mercator grid ticks, zone 13, shown in blue

APPROXIMATE MEAN DECLINATION, 1972

SCALE 1:24 000

CONTOUR INTERVAL 10 FEET
DATUM IS MEAN SEA LEVEL

COLORADO
QUADRANGLE LOCATION

Data portrayed on this map were gathered during detailed geologic mapping, 1970–72.

LANDSLIDE DEPOSITS AND AREAS OF POTENTIAL LANDSLIDING

The terms *landslide* and *landsliding*, as used in this report, refer to the process of downward and outward movement of slope-forming materials – natural rock, soil, artificial fills, or combinations of these materials (Varnes, 1958, p. 20). Landslide deposits are the result of landsliding – they commonly are chaotically jumbled masses of materials resting at or near the bottom of a slide area. The surface of a slide deposit characteristically is hummocky with a bulge at the toe, or bottom, of the deposit. Movement of materials during sliding may be so slow as to be unnoticeable, or it may be extremely rapid.

Landslides pose a potential geologic hazard in the Parker quadrangle. As shown on the map, many deposits of past landslides occur on slopes in the southwest and northeast parts of the quadrangle; yet, because the area is at present very sparsely developed, landslide deposits have gone mostly unnoticed. The deposits shown on the map were discovered during geologic mapping of the quadrangle in 1970-72 (Maberry and Lindvall, 1972). Known landslide deposits in the quadrangle involve relatively small volumes of material and small areas, compared to some landslides elsewhere in the Denver region. In some parts of the Denver region, landslide movements have damaged or destroyed buildings, highways, canals, buried cables and pipelines, and other works of man. The landslides that formed the mapped deposits in the Parker quadrangle were due to natural causes; man has not yet modified the land extensively enough to cause appreciable landsliding.

Generally, landslides in the southwest part of the map area have occurred on steep slopes that are underlain by clay-bearing rocks. The process of sliding has affected both bedrock and surficial materials. Movement probably was initiated mostly by loading and lubrication of the materials by water. Landslides east of Cherry Creek have occurred on slopes underlain by clay-bearing rock and on slopes underlain by loose, windblown sand. Field evidence indicates that the slope angle necessary for natural movement of mixed bedrock and surficial materials is much greater than that necessary for the natural movement of loose sand.

Removing support from a slope and adding load to a slope are the chief ways in which man causes landsliding. Excavation of material from the toe of a landslide deposit or from the base of a previously undisturbed slope can cause sliding. Oversteepening of slopes by excavation can cause sliding. Removal of vegetation from slopes increases runoff, and hence erosion, which oversteepens slopes and may lead to sliding. These excavation practices are fairly common in areas of new development where landslide deposits and the potential for new or renewed sliding are unrecognized. Removal of support from beneath rock ledges may cause large pieces of rock to break off and move downslope.

Loading, either on a slope or at the head of a slope, can cause sliding. The chief ways in which man loads a slope are by construction, addition of fill, and addition of water. Water can lubricate individual particles of earth materials as well as add the load of its weight, and commonly contributes to landsliding in both ways. Loose or poorly consolidated material is especially susceptible to sliding, and may fail if it is saturated with water or if it is otherwise overloaded without adequate advance preventive measures.

Categorization on the map of *areas of known landslide deposits* and of *areas with relatively high potential for landsliding* is based in part on observations made during geologic mapping, and in part on photointerpretation and later spot field checking of landslide deposits.

This map is intended only for use as a guide in land-use planning. Its scale is not considered sufficiently large to allow a high degree of accuracy in the location of the boundaries of landslide deposits. Where there is a question of slope stability in a specific area, the site should be examined by a qualified specialist.

KNOWN LANDSLIDE DEPOSITS

Small earthflow deposits

Deposits of soil and rock detritus formed by a combination of slump and downslope flow of loose materials. The deposits and their source areas are small; earthflow deposits consisting mostly of fine-grained materials commonly are 1-5 feet thick, but may be as much as 10 feet thick. The surface of rupture commonly is spoon shaped. Deposits are chaotically jumbled and commonly bulge at their downslope end. Age and velocity of movement that formed the mapped deposits are unknown, but movement could have occurred very rapidly if materials were saturated with water. Arrow shows general direction of movement; arrow alone is used to depict deposit which is too small to be outlined.

Rockfall deposit or large debris-slide deposit

Coalesced debris-slide and rockfall deposits

Debris slides involve a greater proportion of large particles than do earthflows. Debris-slide deposits commonly are 5-25 feet thick, and are composed of chaotically jumbled silt, sand, clay, and blocks of rock as large as 4-12 feet in maximum dimension. Rockfall deposits are formed of large pieces of bedrock that fell, slid, or rolled downslope. Debris-slide deposits now are much more abundant than rockfall deposits. Well-defined individual deposits of both types are shown in red; arrow indicates inferred direction of past movement. Areas colored purple indicate slopes that are mostly covered by coalesced landslide deposits; individual deposits cannot be distinguished at this map scale. Maximum observed combined area of deposit and source area is 150 feet long downslope from the head of the source, and 50-75 feet wide. One rockfall in the quadrangle occurred sometime during the winter of 1971-72; age of all other movement is unknown.

AREAS WITH RELATIVELY HIGH POTENTIAL FOR LANDSLIDING

Relatively high potential for large debris slides or earthflows

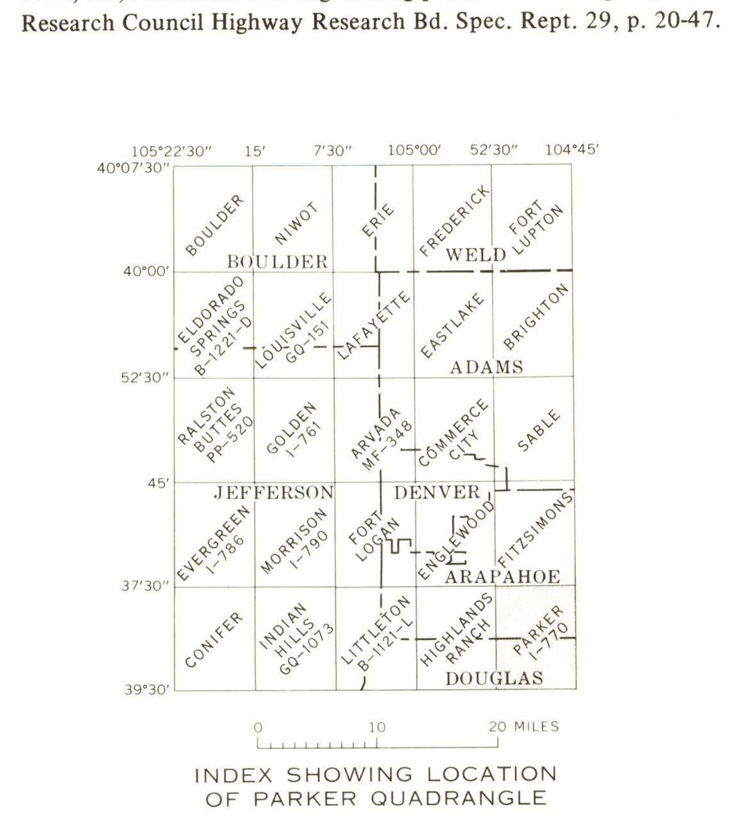
Relatively high potential for small earthflows

Areas of relatively high potential for large debris slides or large earthflows generally are characterized by steep slopes that are mostly covered by unconsolidated material or that have extensive outcrops of clay-bearing bedrock in which the clay is very plastic or has very high swelling-pressure potential. Areas that have a relatively high potential for small earthflows generally are characterized by moderate slopes, mostly underlain by noncohesive surficial material.

REFERENCES CITED

Maberry, J. O., and Lindvall, R. M., 1972, Geologic map of the Parker quadrangle, Arapahoe and Douglas Counties, Colorado: U.S. Geol. Survey Misc. Geol. Inv. Map I-770-A.

Varnes, D. J., 1958, Landslide types and processes, chap. 3 *in* Eckel, E. B., ed., Landslides and engineering practice: Washington, Natl. Research Council Highway Research Bd. Spec. Rept. 29, p. 20-47.



INDEX SHOWING LOCATION OF PARKER QUADRANGLE

MAP SHOWING LANDSLIDE DEPOSITS AND AREAS OF POTENTIAL LANDSLIDING IN THE PARKER QUADRANGLE, ARAPAHOE AND DOUGLAS COUNTIES, COLORADO

By
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1972