Open file 77-832

Map showing landslides and slopes most susceptible to sliding in part of the Aliquippa 7 1/2-minute quadrangle, Beaver County, Pennsylvania

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This map is one of a series of selected 1:24,000 scale quadrangles in the Greater Pittsburgh region which identifies areas with potential slope stability problems significant to development. The map is based on a smaller scale (1:50,000) map showing only landslides in Beaver County (Pomeroy, 1977). Although the Beaver County portion of the Aliquippa quadrangle amounts to only 11 percent of the county area, nearly one-third of the recent slides and almost 20 percent of the older slides in the county occur in the map area.

Intensive interpretation of 1975 aerial photographs (1:24,000) was supplemented by field reconnaissance in the spring of 1976. The map does not purport to show all recent landslides since most slides are too small to be discerned from the aerial photography. Furthermore, many slopes not designated as containing older landslides undoubtedly include such landslides but the geomorphic evidence for them has been obliterated by erosion or modified by man.

This map is essentially a guide to areas of past and present landslides activity and it delineates areas where such detailed studies would be most vital to the general public. It is not intended to replace detailed geological and engineering studies by competent technical personnel where site examinations are necessary in order to determine the degree of difficulty that slope instability may pose to a contemplated land use.

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Bedrock in this portion of southern Beaver County is composed almost entirely of the Conemaugh Group of Pennsylvanian age. Soils derived from the red mudstones of the Conemaugh Group are particularly prone to sliding. Landslide problems occur in soils of the Conemaugh terrain in adjacent Allegheny County (Briggs et al, 1975, and Pomeroy and Davies, 1975). These soils are plastic with a moderate to high shrink-swell potential (U.S. Dept. Agriculture, 1973).

Features shown on the map

Recent landslides.--Fresh scars characterize the youngest landslides in the area (see figure). Most slides have been man-generated in that they usually occur in the proximity of roads, construction sites, farm land etc. Landslides smaller than 10 m (33 ft.) in maximum dimension have not been plotted on the map and are best designated as soil slips.

Old landslides.--Most of the designated older landslide areas do not represent single events but are accumulations of landslide deposits that probably occurred during and immediately after Wisconsin glaciation when rainfall intensity was considerably greater than it is presently. Some mapped older landslides undoubtedly represent movements which might have occurred as late as 50 to 100 years ago. Generally, older landslides form shallow indentations on hillsides which are both concave across slope and downslope. In such areas concentration of ground water is higher than on adjacent slopes and instability is enhanced. Colluvial material along concave slopes is often thicker than 10 m (33 ft.) especially in the lower part of the slope.

Definite older landslides are characterized by conspicuous to slightly subdued hummocky and/or bulgy surfaces along the lower slope.

Criteria for indefinite older landslides are not as distinct but one or more characteristics indicate a probable older landslide.

Older landslides may be presently stable but are often sensitive to modification by man and can be reactivated by excavation, loading, and changes in ground-water and surface-water conditions.

Slopes most susceptible to sliding

Slopes underlain by red mudstones are more susceptible to landsliding than are other slopes. Generally, few slopes less than 15 percent are included within this zone. Soils most susceptible to landsliding often are on slopes which lie on non-red mudstone, shale, and minor siltstone interlayered with the red mudstone. Soils derived from the non-redbeds alone are occasionally unstable.

Red mudstone weathers very rapidly on exposure to air and water and is a source of slope movement when secondary structures such as driveways, sidewalks, patios, etc. are founded on its soil. However, houses with foundations set in red mudstone (bedrock) apparently stand as well as houses set in other rock types.

There are several redbed horizons in the Conemaugh Group but the most persistent redbed unit in the quadrangle is a sequence referred to as the Pittsburgh redbeds. Its thickness varies but probably averages 12 m (40 ft.) to 18 m (60 ft.) in the quadrangle. Red mudstones significantly lower in the section were seen along Raccoon Creek west of Independence. Redbeds were also observed considerably above the Pittsburgh redbeds zone in a relatively new subdivision 1.5 km (1 mi.) west-northwest of Five Points in Hopewell Township.

Large unstable colluvial slopes are located along Raccoon Creek. These areas are not necessarily related to redbed horizons. At the point of maximum curvature of the stream where the slope receives the greatest impact from the water, new slides have developed as in the colluvial slopes showing extensive recent slumping as well as relict slide areas west and southeast of Independence and also in Center Township.

References cited

Briggs, R. P., Pomeroy, J. S., and Davies, W. E., 1975, Landsliding in Allegheny County, Pennsylvania: U.S. Geol. Survey Circ. 728, 18 p.

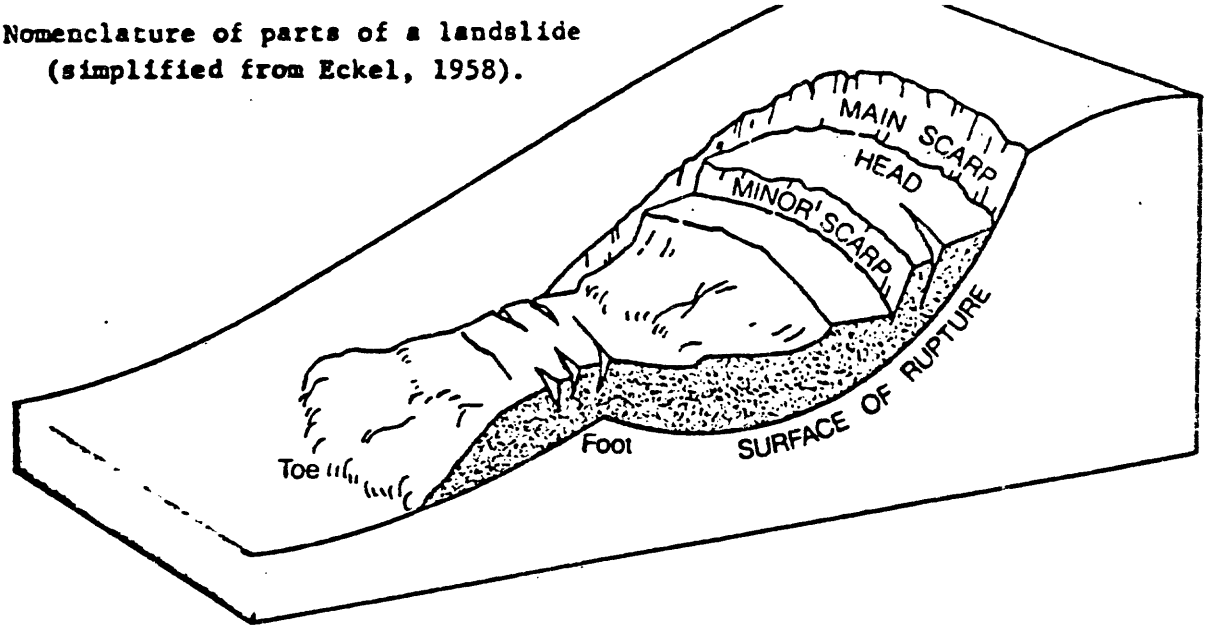
Eckel, E. B., ed., 1958, Landslides and engineering practise. Natl. Research Council Highway Research Board Spec. Rept. 29, 232 p. (also available as Natl. Research Council Pub. 544, 1958).

Pomeroy, J. S., and Davies, W. E., 1975, Map of susceptibility to landsliding, Allegheny County, Pennsylvania: U.S. Geol. Survey Misc. Fiedl Studies Map MF-685 B, 2 sheets w/ text.

Pomeroy, J. S., 1977, Preliminary reconnaissance map showing landslides in Beaver County, Pennsylvania: U.S. Geol. Survey open-file rept., no. 77-245, 4 p. 1 pl.

U.S. Department of Agriculture, Soil Conservation Service, 1973, Soil interpretations and soil maps for Beaver County, Pennsylvania.

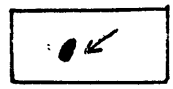
Nomenclature of parts of a landslide
(simplified from Eckel, 1958).



EXPLANATION

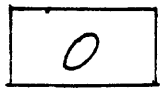
(see text for additional information)

RECENT LANDSLIDES

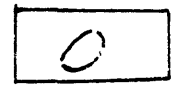


Well-defined, characterized by fresh scars, may still be active. Arrow points to darkened area indicative of a recent slide.

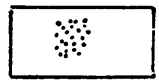
OLDER LANDSLIDES



Definite, boundaries approximate.



Indefinite, fair to poor definition, boundaries inferred.



Slopes most susceptible to landsliding Underlain largely by red mudstones of Conemaugh Group

NOTE

Variations in slope sensitivity may occur at any specific point within a unit. Boundaries largely are inferred and information given is intended as a general guide and should not be construed as applicable to all localities within the area shown. This map contains data usable in identification of areas involving slope stability but it cannot be used as a substitute for detailed engineering investigations of specific sites.