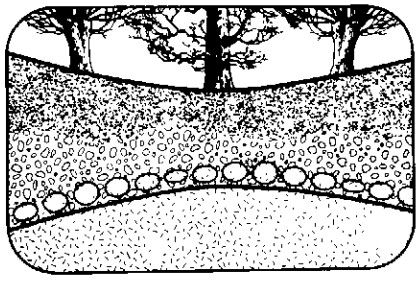
Features



The Soil Column

Comments on Hazard Land Zoning

R. M. Quigley
Faculty of Engineering Science
The University of Western Ontario
London, Ontario

Many levels of government are currently involved in extensive land zoning or planning activities of great concern to both small and big scale landowners. The criteria used in establishing zoning or land-use maps cover many technical items such as slope angle, soil type, drainage and/or ground water level, depth to bedrock, etc. In addition to technical considerations, economic factors figure heavily in how a given criterion is established and used. For example, bedrock excavation for installation of sewers is extremely expensive, hence a low rating for areas with a shallow soil cover even though such an area might be quite suitable for a septic mound at a cottage site. Thick, soft, organic deposits are subject to large settlements and may require expensive piled foundations rather than spread footings, hence a low rating.

Hazard land zoning is applied to areas in which special hazards exist such as potential for river or shoreline flooding, steep unsafe slopes, muck deposits, etc. A landowner who has had his land designated as hazard land is prevented from any development until the problems of hazard are rectified and the area is re-zoned. It is frequently implicit in the adoption of Official Plans that the government is under no obligation to purchase such lands in compensation for establishing the hazard zoning. In many cases, such zoning is equivalent to planning by confiscation, a brutal procedure especially if it is the case of a big government versus a small, individual landowner.

Slope angle criteria are particularly powerful and are being used extensively for cartographic zoning by government agencies. It is the purpose of the *Soil Column* to critically review slope angle criteria currently in use and to show how unjust such criteria may be to small land holders, particularly in cottage areas.

Typical slope angle criteria are shown in Table I.

Table I

Rating	Slope %	Slope Degrees	Comment
Satisfactory	0- 2	0° 1°	Surface drainage problems
Optimum	2- 5	1° 3°	Servicing and drainage ideal
Satisfactory	5-10	3° 6°	Servicing costly
Marginal	10-10	6° 12°	Servicing very costly
Unsatisfactory	> 20	> 12°	Servicing usually impossible

It should be particularly noted that the cost of servicing (sewers, water mains, roads, etc.) dominates the rating. Many cottage lots do not require such servicing hence a 10 to 20 per cent slope could be rated satisfactory or even good for such lots rather than marginal as in the tabulation.

It has been suggested in planning or environmental reports that slopes in the 13 to 20 per cent range have a potential for soil creep and slumping. Even an elementary look at basic soil mechanics indicates that this normally is not so, as shown descriptively in Figure 1. Drained sand slopes are stable at angles of 30° (58%) although they may creep a little. Wet sand slopes and wet clay slopes with horizontal seepage are generally stable at angles of 15° (27%) unless extraordinary conditions prevail in the slopes such as artesian water conditions In certain geographic areas such as Western Canada, montmorillonites are present in the soil and the friction angle may be considerably lower than that for Ontario clays, hence flatter slopes are required. However, these are soil mechanics problems requiring technical solution and the writer believes that they should not be covered by rigid criteria. It should be further noted that slope drainage measures are standard in the safe design and construction of slopes far steeper than the very restrictive zoning limitations of 20 per cent (12°).

Many cottage lots on slopes in excess of 20 per cent are quite stable, but since they fall outside the normal limiting criteria they are zoned hazard lands. As already mentioned, such lots

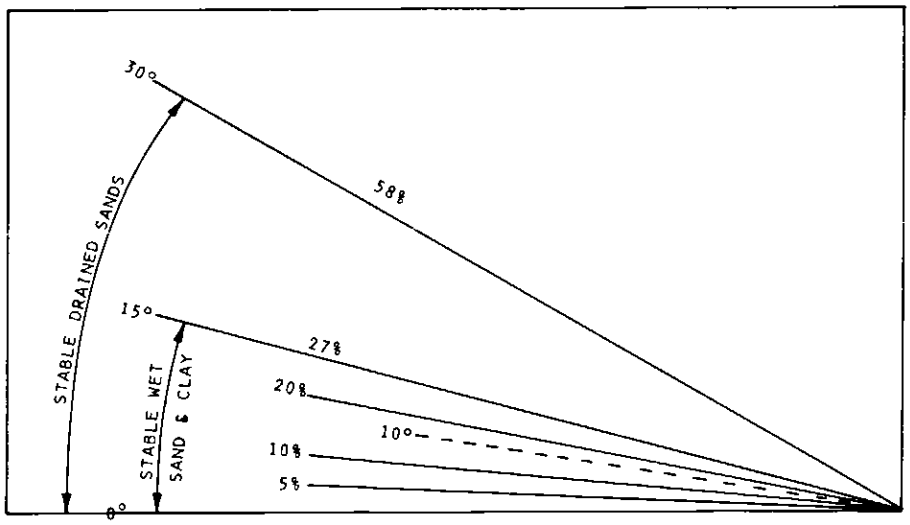


Figure 1
Slope angles and slope stability

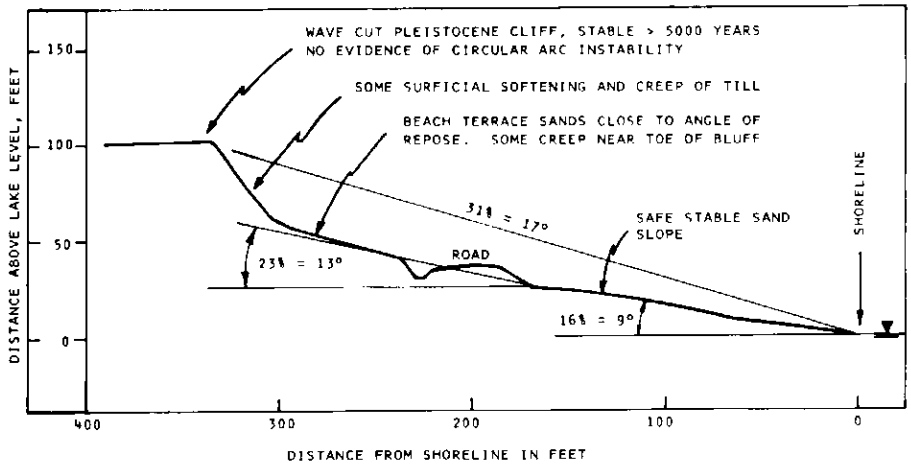


Figure 2
Cross section of a shoreline lot zoned hazard land using slope angle zoning criteria

rarely require municipal servicing which is the major cost factor in establishing the 20 per cent slope limit. The small amount of piping required to supply well water and service a septic system can be installed relatively easily and safely in such slopes Appeal of a hazard zoning designation or an application for re-zoning is an expensive business well beyond the financial capabilities of many small landowners.

In one case with which the writer is familiar, an entire 6½ acre lot was zoned hazard land since the overall slope was about 31 per cent as shown in Figure 2. This was in spite of the fact that the central portion of the lot had a 9° (16%) slope quite suitable for cottage development. In this case numerous government witnesses appeared at public expense to testify against a single, small landowner

Ironically the table-land above the slopes in question has now apparently been sold to a subdivision developer who, with improper drainage engineering, could initiate slope instability and do very great damage to the shoreline environment in question.

MS received February 12, 1975.