Chapter 1
Introduction

According to available information, landsliding in the United States causes an average of 25 to 50 deaths (Committee on Ground Failure Hazards, 1985) and $1 to $2 billion in economic losses annually (Schuster and Fleming, 1986). Although all 50 states are subject to landslide activity, the Rocky Mountain, Appalachian, and Pacific Coast regions generally suffer the greatest landslide losses (Figures 1a, b). The costs of landsliding can be direct or indirect and range from the expense of cleanup and repair or replacement of structures to lost tax revenues and reduced productivity and property values.

Landslide losses are growing in the United States despite the availability of successful techniques for landslide management and control. The failure to lessen the problem is primarily due to the ever-increasing pressure of development in areas of geologically hazardous terrain and the failure of responsible government entities and private developers to recognize landslide hazards and to apply appropriate measures for their mitigation, even though there is overwhelming evidence that landslide hazard mitigation programs serve both public and private interests by saving many times the cost of implementation. The high cost of landslide damage (Table 1) will continue to increase if community development and capital investments continue without taking advantage of the opportunities that currently exist to mitigate the effects of landslides.

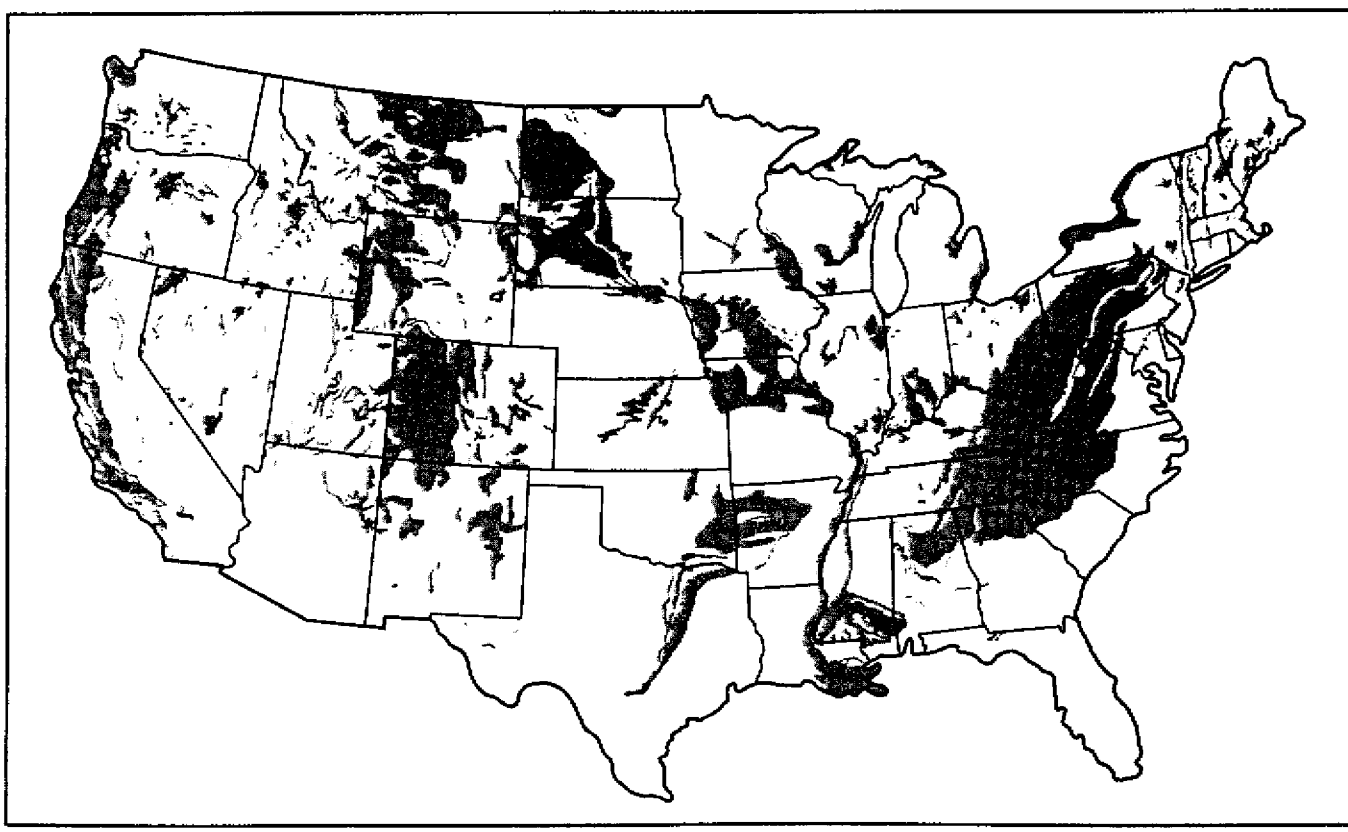

Figure 1a. Map showing relative potential of different parts of the conterminous United States to landsliding (U.S. Geological Survey, 1981a).

Table 1. Estimates of minimum amounts of landslide damage in the United States, 1973–1983, in millions of dollars. All figures are estimates. Figures queried are very rough estimates (adapted from Brabb, 1984).

State	Damage 1973–1983 State Roads ($M)	Priv. Prop. ($M)	Total ($M)	Ann. Avg. ($M)
Alabama	10.0	0.5	10 5	1.05
Alaska	10 0	0.0	10 0	1.0
Arizona	2.0	0.0	2.0	0.2
Arkansas	2.0	0.0	2.0	0.2
California	800.0 ?	200 0 ?	1000.0 ?	100.0 ?
Colorado	20.0	50.0	70.0	7.0
Connecticut	0.0	0.0	0.0	0.0
Delaware	2 0	0.0	2 0	0.2
Dist. of Columbia	0.1	0.1	0.01	0.8
Florida	0.0	0.0	0.0	0.0
Georgia	1.0 ?	0.0	1.0 ?	0.1 ?
Hawaii	4.0	0.5	4.5	0.45
Idaho	10.0 ?	1.0 ?	11.0 ?	1.1 ?
Illinois	1.0	1 0 ?	2.0 ?	0 2 ?
Indiana	10 0	1.0	11.0	1.1
Iowa	1.0	0.3	1.3	0.13
Kansas	1.0	0.3 ?	1.3 ?	0.13
Kentucky	180.0	10.0 ?	190.0 ?	19.0 ?
Louisiana	2.0	0.3	2.3	0.23
Maine	0.3	0.3	0.6	0.06
Maryland	20.0	0.0	20.0	2.0
Massachusetts	0.3	0.0	0.3	0.03
Michigan	0.1	0.0	0.1	0.01
Minnesota	7.0	0.0	7 0	0.7
Mississippi	3.0	0.5	3.5	0.35
Missouri	2.0 ?	1.0 ?	3.0 ?	0.3 ?
Montana	10.0 ?	1.0 ?	11.0 ?	1.1 ?
Nebraska	0.4	0.4 ?	0.8 ?	0.08 ?
Nevada	2.0 ?	0.5	2.5 ?	0.25 ?
New Hampshire	10.0	0.0	10.0	1 0
New Jersey	3.0	3 0	6.0	0.6
New Mexico	3.0	1.0	4.0	0.4
New York	20.0	50.0 ?	70.0 ?	7.0 ?
North Carolina	45.0	0.5	45.5	4.55
North Dakota	4.0	0.0	4.0	0.4
Ohio	60.0 ?	40.0	100.0 ?	10.0
Oklahoma	2.0 ?	0.0	2.0 ?	0 2 ?
Oregon	30.0	10.0	40.0	4 0
Pennsylvania	50.0	10.0 ?	60.0 ?	6.0
Rhode Island	0.0	0.0	0.0	0.0
South Carolina	0.0	0.0	0.0	0.0
South Dakota	16.0	2.0	18.0	1.8
Tennessee	100.0	10.0 ?	110.0 ?	11.0 ?
Texas	8.0	0.0	8.0	0.8
Utah	200.0 ?	10.0 ?	210.0 ?	21.0 ?
Vermont	3.0	0.5	3.5	0.35
Virginia	11.0	1.0	12.0	1.2
Washington	70.0 ?	30.0 ?	100.0 ?	10.0 ?
West Virginia	270.0	5.0	275.0	27.5
Wisconsin	0.2	0.5	0.7	0.07
Wyoming	4.0	0 0	4.0	0.4
Total (U.S.)	**2010.3**	**442.2**	**2452.5**	**245.25**

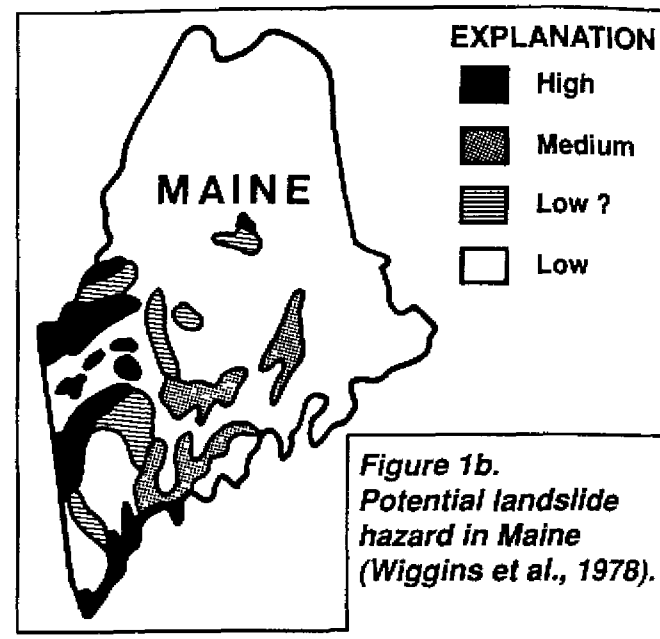

Figure 1b. Potential landslide hazard in Maine (Wiggins et al., 1978).

The widespread occurrence of landsliding, together with the potential for catastrophic statewide and regional impacts, emphasizes the need for cooperation among federal, state, and local governments and the private sector. Although annual landslide losses in the U.S. are extremely high, significant reductions in future losses can be achieved through a combination of landslide hazard mitigation and emergency management.

Landslide hazard mitigation consists of those activities that reduce the likelihood of occurrence of damaging landslides and minimize the effects of the landslides that do occur. The goal of emergency management is to minimize loss of life and property damage through the timely and efficient commitment of available resources.

Despite their common goals, emergency management and hazard mitigation activities have historically been carried out independently. The integration of these two efforts is most often demonstrated in the recovery phase following a disaster, when decisions about reconstruction and future land uses in the community are made.

> Emergency management, if well executed, can do much to minimize the loss and suffering associated with a particular disaster. However, unless it is guided by the goals of preventing or reducing long-term hazard losses, it is unlikely to reduce the adverse impact of future disasters

significantly. This is where mitigation becomes important (Advisory Board on the Built Environment, 1983, p. 9).

Purpose of this Guidebook

As mentioned above, the development and implementation of landslide loss-reduction strategies requires the cooperation of many public and private institutions, all levels of government, and private citizens. Coordinated and comprehensive systems for landslide hazard mitigation do not currently exist in most states and communities faced with the problem. In most states, local governments often take the lead by identifying goals and objectives, controlling land use, providing hazard information and technical assistance to property owners and developers, and implementing mitigation projects as resources allow. State and federal agencies play supporting roles—primarily financial, technical, and administrative. In some cases, however, legislation originating at the state or federal level is the sole impetus for stimulating effective local mitigation activity.

In many states there remains a need to develop long-term organizational systems at state and local levels to deal with landslide hazard mitigation in a coordinated and systematic manner. The development of a landslide hazard mitigation plan can be the initial step in the establishment of state and local programs that promote long-term landslide loss reduction.

The purpose of this guidebook is to provide a practical, politically feasible guide for state and local officials involved in landslide hazard mitigation. The guidebook presents concepts and a framework for the preparation of state and local landslide hazard mitigation plans. It outlines a basic methodology, provides information on available resources, and offers suggestions on the formation of an interdisciplinary mitigation planning team and a permanent state natural hazards mitigation organization. Individual states and local jurisdictions can adapt the suggestions in this book to meet their own unique needs.

Because of its involvement in identifying and mitigating landslide hazards, the state of Colorado was selected by the Federal Emergency Management Agency (FEMA) to produce a prototype state landslide hazard mitigation plan. The technical information contained in the plan was designed to be transferable to other states and local jurisdictions and suitable for incorporation into other plans. The planning process can also serve as an example to other states and localities dealing with landslide problems. The materials contained in the Colorado Landslide Hazard Mitigation Plan (Colorado Geological Survey et al., 1988) were intended to complement the information presented in this guidebook. In an effort to promote landslide hazard mitigation nationally, FEMA has provided for the distribution of these two documents to all states. ❑