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Minimum landslide damage in the United States, 1973-1983

by

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The cost of landslide damage in the United States is an active topic that has been discussed by Schuster (1978), Fleming and Taylor (1980), Wiggins, Slosson and Krohn (1978), Petak and Atkisson (1982), and several others. All cost estimates have been prepared from samples in small areas or from responses to questionnaires for only several states, so that the reliability of a figure for the entire country is in doubt. Taylor and Brabb (1972), among others, have pointed out some of the difficulties in getting reliable information for even the San Francisco Bay region where public awareness about landslide problems is large and where a lot of cost information is available.

Late in 1981, I began visits to all 50 States in an attempt to obtain the most readily available information about the extent and expense of the landslide problem. By late 1983, all State highway departments and State geological surveys were contacted or visited. Even though the amount of time available for each State was small, generally 3 to 4 days, much new information was obtained, most of it from files not generally available to the public, or from estimates provided by State officials. The information on costs is shown on Table 1.

Information on damages to roads is almost completely from engineers and geologists in State highway departments. Most of the total figures for roads were derived by adding their estimated cost of individual landslides along State highways; some figures are their rough estimates for the entire State.

No attempt was made to estimate the cost of landsliding to city and county roads or to roads on Federal lands such as those administered by the U.S. Forest Service, U.S. Bureau of Land Management and U.S. Park Service. In the San Francisco Bay region, Taylor and Brabb (1972) determined that the total cost of landslides on county roads varied widely, from about one-third the costs of those on State highways in Sonoma County to more than 7 times the cost of those on State highways in Alameda County. Landslide damage to roads in National Parks and National Forests is extensive, but the total cost has not been determined.

For comparison, R. G. Chassie and R. D. Goughnour of the Federal Highway Administration (written commun., 1983) estimated that approximately $50,000,000 was spent annually in the mid 1970's on landslides along Federal-aid highways in the United States, and that the total landslide costs for all highway landslides was at least $100,000,000 annually.

The estimates for damage to private property are from geologists in State geological surveys, from newspaper clippings, and from reports like those by Taylor and Brabb (1972) and Fleming and Taylor (1980). In order to provide a comparison between estimates obtained for each State with those prepared from small samples, building loss-figures for 1970 from Wiggins, Slosson and Krohn (1978, table 2-8, map no.2) have been included in Table 1.

The cost figures in Table 1 are unquestionably minimal because much landslide damage is not reported. Many of the figures are rough estimates, and no attempt was made to correct for inflation. The table also lacks costs for landslides occurring as part of major disasters that happened before 1973, such as the Alaskan earthquake (1964) and Hurricane Camille (1969), because the recurrence intervals of events of this scope and cost are not well established, and thus the average yearly cost and the 10-year total could not

be determined. Landslide damage costs for the Mount St. Helens eruption of 1980, although large, have not been distinquished from ash fall and flooding damage and were likewise not added to the table. Shoreline erosion along the Great Lakes is a substantial problem costing at least $230 million in Ohio, New York, Wisconsin, Michigan, Illinois and Indiana from 1972 to 1976 (U.S. Army Corps of Engineers, 1978), but the amount attributable to landsliding alone could not be determined; therefore, these figures were not included in the table.

Table 1 indicates that landslide damage to State roads in the United States was at least $200 million annually during the period 1973-1983. For private property the figure is at least $40 million annually. Adding landslide damage costs for the Alaskan earthquake, Hurricane Camille, the Mount St. Helens eruption and other disasters would substantially increase those figures. Adding indirect costs, such as loss of tax revenues on properties devalued as a result of landslides, loss of productivity on agricultural and forest lands affected by landslides, loss of reservoir capacity by siltation and cost of detours around landslides would also substantially increase the total costs shown in Table 1.

The 1983 landslides in Utah provide an example of the great difficulty in compiling damage figures that are correct by even an order of magnitude. Before the 1983 landslides, the total for the 10-year period would have been about $2 million. Direct costs for just one 1983 landslide at Thistle, Utah, will exceed $200 million, according to Kaliser (1983, p.4). The lesson is not only that reliable estimates of landslide damage are difficult to obtain, but also that States with low landslide damage from 1973-1983 may face much more catastrophic events in the years ahead.

The geographic distribution of landslide damage in the United States is probably accurately reflected in Table 1 except for landsliding associated with shoreline erosion around the Great Lakes. The figures indicate that about one-half the landslide damage occurs in the Pacific Coast States of California, Washington, Oregon and Alaska; 37 percent in the Applachian States extending from Maine to Alabama; and about 13 percent in the Rocky Mountain States, especially Utah and Colorado.

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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.

| | Damage 1973 - 1983 | | | Annual Average ($M) | 1970 Building Damage from Wiggins and others (1978) ($M) |
	State Roads ($M)	Private Property ($M)	Total ($M)		
Alabama	10	0.5	10.5	1.05	4.6
Alaska	10	0	10	1	0
Arizona	2	0	2	0.2	2.3
Arkansas	2	0	2	0.2	3.0
California	800 ?	200 ?	1000 ?	100 ?	36.8
Colorado	20	50	70	7	6.3
Connecticut	0	0	0	0	10.3
Delaware	2	0	2	0.2	1.6
District of Columbia 0	0.1	0.1	0.01	0.8	
Florida	0	0	0	0	3.9
Georgia	1 ?	0	1 ?	0.1 ?	5.1
Hawaii	4	0.5	4.5	0.45	0
Idaho	10 ?	1 ?	11 ?	1.1 ?	1.0
Illinois	1	1 ?	2 ?	0.2 ?	33.2
Indiana	10	1	11	1.1	6.8
Iowa	1	0.3	1.3	0.13	5.2
Kansas	1	0.3 ?	1.3 ?	0.13	3.4
Kentucky	180	10 ?	190 ?	19 ?	6.0
Louisiana	2	.3	2.3	0.23	6.0
Maine	0.3	0.3	0.6	0.06	2.1
Maryland	20	0	20	2	12.0
Massachusetts	0.3	0	0.3	0.03	13.2
Michigan	0.1	0	0.1	0.01	19.5
Minnesota	7	0	7	0.7	5.5
Mississippi	3	0.5	3.5	0.35	2.8
Missouri	2 ?	1 ?	3 ?	0.3 ?	10.8
Montana	10 ?	1 ?	11 ?	1.1 ?	1.2
Nebraska	0.4	0.4 ?	0.8 ?	0.08 ?	2.6
Nevada	2 ?	0.5	2.5 ?	0.25 ?	0.6
New Hampshire	10	0	10	1	1.5
New Jersey	3	3	6	0.6	10.7
New Mexico	3	1 .	4	0.4	0.8
New York	20	50 ?	70 ?	7 ?	29.4
North Carolina	45	0.5	45.5	4.55	9.8
North Dakota	4	0	4	0.4	1.1
Ohio	60 ?	40	100 ?	10	21.9
Oklahoma	2 ?	0	2 ?	0.2 ?	2.2
Oregon	30	10	40	4	4.2
Pennsylvania	50	10 ?	60 ?	6	24.9
Rhode Island	0	0	0	0	0.6
South Carolina	0	0	0	0	3.2
South Dakota	16	2	18	1.8	1.3
Tennessee	100	10 ?	110 ?	11 ?	2.0
Texas	8	0	8	0.8	11.4
Utah	200 ?	10 ?	210 ?	21 ?	3.1
Vermont	3	0.5	3.5	0.35	0.5
Virginia	11	1	12	1.2	8.9
Washington	70 ?	30 ?	100 ?	10 ?	10.4
West Virginia	270	5	275	27.5	4.9
Wisconsin	0.2	0.5	0.7	0.07	10.4
Wyoming	4	0	4	0.4	0.7
Total US	$2010.3M	$442.2M	$2452.5M	$245.25M	$370.5M