MAP SHOWING LANDSLIDES IN CALIFORNIA THAT HAVE CAUSED FATALITIES OR AT LEAST $ 1,000,000 IN DAMAGES FROM 1906 TO 1984

By

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INTRODUCTION

Understanding where landslide processes in California have been most severe is helpful in determining priorities for landslide mapping, mitigation measures, and preparedness planning. Although a few studies of landslide damage and fatalities have been published (see sources of data 12, 17, 34, 36, 40), and many more reports mention landslide damage and fatalities incidentally, our map is the first to show where the problem is most severe for the entire state.

MAP INFORMATION

The information on the map has been compiled from readily available published documents, newspaper clippings, and unpublished material provided by the California Department of Transportation. The earliest landslide reported was in 1906 and the latest in 1984. Many more fatalities and major landslides have probably occurred but have not been reported, are reported in documents not readily available to us, or are hidden in documents with general titles. The map, therefore, shows the minimum amount of fatalities and damage that has occurred.

Similarly, the costs reported are the minimum direct costs. No attempt was made to determine indirect costs such as litigation, tax loss due to decrease in appraised value, decrease in agricultural or industrial production, or adverse effects on water quality in streams and irrigation facilities.

Dollar figures prior to 1982 are adjusted for inflation using Gross National Product Deflator figures provided by R.L. Bernkopf, U.S. Geological Survey (oral commun., March 2, 1984). When the damage for a locality was reported to occur over more than 1 year, no adjustments were made. Totals are rounded to the nearest $100,000.

Damages and fatalities for large, regional areas on the map are calculated separately (table 1). These figures include damages at some of the smaller, specific, and numbered sites. Some of the regional areas overlap, and thus some of the totals probably include duplicate damage and fatality figures.

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EXPLANATION

Specific Damages and Fatalities

(Number refers to locality on map, See "Sources of data" for numbered sources)

1. Collier landslide, 1969, Interstate Highway 5, 8 miles north of Yreka, Siskiyou County.
   Fatalities: One
   Cost: $2,400,000
   Source: 46 (District 2)
2. Cade Mountain landslide, continuing to present, California Highway 96, 10 miles east of Happy Camp, Siskiyou County.
   Cost: $2,000,000
   Area has a long history of landslide problems.
   Source: 46 (District 2)
3. Browns Creek landslide, 1961-1984, California Highway 96, 10 miles south of Happy Camp, Siskiyou County.
   Cost: $1,400,000
   Intermittent road closures.
   Source: 46 (District 2)
4. Panorama Point landslide, 1959-1984, Interstate Highway 5, 5 miles south of Dunsmuir, Shasta County.
   Cost: $3,000,000
   Source: 46 (District 2)
5. Sweetbrier landslide, 1960, Interstate Highway 5, 15 miles south of Dunsmuir, Shasta County.
   Cost: $1,000,000
   Source: 46 (District 2)
6. Trinity 299-2.1, landslide, 1981, California Highway 299, mile post 2.1, 6 miles south of Willow Creek, Trinity County.
   Cost: $1,000,000
   Source: 46 (District 1)
7. Trinity 299-3.4, landslide, 1982, California Highway 299, mile post 3.4, 7.5 miles south of Willow Creek, Trinity County.
   Cost: $1,000,000
   Source: 46 (District 1)
8. Estrellita landslide, 1982-83, California Highway 3, 10 miles north of Weaverville, Trinity County.
   Cost: $1,800,000
   Source: 46 (District 2)
9. Fawn Lodge landslide, 1963-1984, California Highway 299, 20 miles southeast of Weaverville, Trinity County.
   Cost: $1,900,000
   Source: 46 (District 2)
10. Piercy landslide, 1979-1984, U.S. Highway 101, near Piercy, Mendocino County.
    Cost: $1,200,000
    Source: 46 (District 1)
11. Carl's landslide, 1979, U.S. Highway 101, 10 miles north of Leggett, Mendocino County.
    Cost: $1,300,000
    Source: 46 (District 1)
12. Kyburz landslide, 1983, U.S. Highway 50, 5.5. miles west of Kyburz (south of Lake Tahoe), Placer County.
    Cost: $2,100,000
    Road closed for 75 days
    Source: 46 (District 3)
13. Lake landslide, 1983, California Highway 20, 10 miles east of Clearlake Oaks, Lake County.
    Cost: $2,300,000
    Source: 46 (District 1)
14. Preston Bridge-Cloverdale landslide, 1938-1970, U.S. Highway 101, mile post 54.6, 5 miles north of Cloverdale, Sonoma County.
    Cost: $4,600,000
    Source: 46 (District 4)
15. Alta landslide, 1960, Interstate Highway 80, 15 miles west of Emigrant Gap, Placer County.
    Cost: $3,000,000
    Source: 46 (District 3)
16. Pinole landslide, 1969, Interstate Highway 80, post mile 7, 6 miles north of Richmond, Contra Costa County.
    Cost: $1,600,000
    Source: 46 (District 4)
17. San Pablo Creek culvert failure, 1975, Interstate Highway 80, mile post 4.7, 3 miles north of Richmond, Contra Costa County.
    Cost: $2,300,000
    Source: 46 (Distr.ct 4)
18. Sonoma Coast State Beach, 1978, Sonoma County.
    Fatalities: Two due to a rockfall
    Source: 50
19. Orinda NW landslide, 1966-1979, California Highway 24, mile post 2.1, 10 miles east of Walnut Creek, Contra Costa County.
    Cost: $1,000,000
    Source: 46 (District 4)
20. Orinda landslide, 1962, Del Valle Drive, Contra Costa County.
    Fatalities: One due to a mudflow.
    Source: 42
21. Alamo landslide, 1983, Interstate Highway 680, mile post 9.75, 5 miles south of Walnut Creek, Contra Costa County.
    Cost: $1,000,000
    Source: 46 (District 4)
22. Crestmont District landslide, 1962, Kimberlin Heights Drive, Oakland, Alameda County.
    Fatalities: One due to a debris flow.
    Source: 42
23. Waldo landslide, 1982, U.S. Highway 101, mile post 1.4, 2 miles north of the Golden Gate Bridge, Marin County.
    Fatalities: One
    Cost: $1,900,000
    Source: 46 (District 4)
24. Mount Davidson landslide, 1942, San Francisco County.
    Fatalities: Two due to mud slides
    Source: 2
25. China Beach landslide, west of Lincoln Park Golf Course, 1959, San Francisco County.
    Fatalities: One
    Source: 41
26. Potrero Hill landslide, 1967, Interstate Highway 280, mile post 6.5, 3 miles east of the James Lick Freeway exchange, San Francisco County.
    Cost: $3,000,000
    Source: 46 (District 4)
27. Oddstadt landslide, Pacifica, 1982, San Mateo County
    Fatalities: Three (see item 18)
    Cost: $1,000,000: Five houses destroyed.
    Source: 36, 51
28. Devils Slide, 1937-1983, California Highway 1, mile post 39.1, 4 miles south of Pacifica, San Mateo County.
    Cost: $2,300,000 (to 1983; by-pass costs may be as much as $50,000,000)
    Source: 46 (District 4)
29. Niles Canyon-Roemarmes railroad underpass, 1983, California Highway 84, mile post 12.1, 10 miles north of Newark, Alameda County.
    Cost: $1,300,000
    Traffic restricted for eight months.
    Source: 46 (District 4)
30. Altamont landslide, 1983, Interstate Highway 580, mile post 6.9, 10 miles east of Livermore, Alameda County.
    Cost: $1,200,000
    Source: 46 (District 4)
31. TUD-120 landslide, 1979, California Highway 120, mile post 19.6, 15 miles north of Coulterville, Tuolumne County.
    Cost: $1,300,000
    Source: 46 (District 10)
32. Yosemite National Park, 1980, Tuolumne County.
    Fatalites: Three fatalities due to a rock slide.
    Source: 44
33. Woodside 280 landslide, 1974, Interstate Highway 280, mile post 3.5, 5 miles west of Redwood City, San Mateo County.
    Cost: $2,300,000
    Source: 46 (District 4)
33a. Woodside 114 landslide, 1983, California Highway 84, mile post .05, 4 miles west of Redwood City, San Mateo County.
    Cost: $3,000,000
    Source: 46 (District 4)
34. San Jose Highlands landslide, 1972, eastern foothills of San Jose, Santa Clara County.
    Cost: $2,600,000
    $2,700,000 proposed to buy out home owners in 1983
    Source: 17, 18
35. Love Creek landslide, 1982, 10 miles north of Santa Cruz, Santa Cruz County.
    Fatalities: 10 (included in San Francisco Bay region total; see Regional Damage, table 1), based upon the number of lives lost, this is the most destructive naturally induced landslide in California history.
    Cost: Nine houses buried
    Source: 37
36. Opal Cliff Drive landslide, 1980, Santa Cruz, Santa Cruz County.
    Fatalities: One due to the collapse of a beach cliff.
    Source: 43
37. Scotia, 1983, Southern Pacific Railroad, Humboldt County.
    Cost: $3,000,000 to repair; line abandoned
    Source: 16
38. Santa Cruz landslide, 1983, California Highway 129, mile post 5.9, 5 miles east of Watsonville, Santa Cruz County.
    Cost: $1,200,000
    Source: 46 (District 4)
39. Pacheco Pass landslide, 1983, California Highway 152, mile post 31.5, 25 miles east of Gilroy, Santa Clara County.
    Cost: $1,000,000
    Source: 46 (District 4)
40. San Luis Dam landslide, 1981, San Luis Reservoir in western Merced County.
    Cost: $6,500,000
    Source: 32
41. Big Sur landslide (Also called J. P. Burns Landslide) 1983, California Highway 1, mile post 36.2, 9 miles south of Big Sur, Monterey County.
    Fatalities One
    Cost: $7,300,000
    Highway closed for over one year.
    Source: 21, 46 (District 5), 47
42. SLO 46-9.6 landslide, 1983, California Highway 46, mile post 9.6, 15 miles west of Paso Robles, San Luis Obispo County.
    Cost: $1,700,000
    Highway closed for two months.
    Source: 46 (District 5)
43. Kern-178 landslide, 1984, State Highway 178, mile post 15, 15 miles east of Bakersfield, Kern County.
    Cost: $1,000,000
    Source: 46 (District 6)
44. West Fork landslide, 1967, Interstate Highway 5, 2.5 miles north of Newhall, northern Los Angeles County.
    Cost: $3,900,000
    Source: 46 (District 7)
45. Crystal Creek Road landslide, 1983, 25 miles west of Redding, Shasta County.
    Fatalities: One
    Source: 61
46. St. Francis Dam failure, 1928, 9 miles north of Saugus; 45 miles northwest of Los Angeles, Los Angeles County.
    Fatalities: Over 500
    Cost: $63,300,000
    Failure may or may not have been caused by landsliding.
    Source: 45
47. Princess Park landslide, 1970, California Highway 14, 10 miles north of Newhall, near Saugus, northern Los Angeles County.
    Cost: $6,800,000
    Source: 46 (District 7)
48. Clear Lake, 1983, Clear Lake County.
    Fatalities: One due to a mudslide
    Source: 55
49. Sherman Oaks, 1962, Los Angeles County.
    Fatalities: One
    Source: 56
50. Malibu landslide, 1979, California Highway 1, 10 miles west of Santa Monica, Los Angeles County.
    Cost: $1,000,000 to mo e than $1,300,000.
    Source: 30
51. Topanga Canyon, 1969, on California Highway 27, 10 miles north of intersection with State Highway 1, Los Angeles County.
    Fatalities: Three fatalities due to mudslides.
    Source: 14
52. Big Rock landslide, 1979, California Highway 1, 2 miles east of Malibu, Los Angeles County.
    Cost: $6,400,000
    Highway closed for 2 months.
    Source: 46 (District 7)
53. Mulholland Cut landslide, 1961, Interstate Highway 405, 11 miles north of Santa Monica, Los Angeles County.
    Cost: $7,500,000
    Source: 46 (District 7)
54. Area of Highland Park, Sherman Oaks, Verdugo Hills, Brentwood, Bel Air, Hollywood Hills, Encino and Glendale, 1969, north of Los Angeles, Los Angeles County.
    Fatalities: Seven fatalities due to mudslides.
    Source: 14
55. Portuguese Bend-Pacific Palisades, 1956-1965, 5 miles north of Santa Monica on California Highway 1, Los Angeles County.
    a. Portuguese Bend landslide, 1956
    Cost: Litigation involved $19,000,000
    Court awarded $7,400,000
    150 houses destroyed
    b. Pacific Palisades landslide, 1958-1971
    Cost: $5,500,000
    c. Flagg's Restaurant landslide, 1958
    Fatalities: One
    Source: 1, 3, 4, 5, 6, 7, 8, 10
56. London Road landslide, 1968, Oakland, Alameda County.
    Cost: Reported as part of San Francisco Bay Region total
    Source: 12
57. Monterey Park-Repetto Hills landslide, 1977-1980, 5 miles south of Pasadena and south of Interstate Highway 10, Los Angeles County.
    Fatalites 1962, One due to a mudslide.
    Cost: (1977-78) $1,800,000
    (1979-80) $4,500,000: Including damage to more than 100 dwellings in 1980 due to debris flows.
    Source: 22, 31, 56
58. Glendora landslide, 1969, 15 miles east of Pasadena and north of Interstate Highway 210, Los Angeles County.
    Cost: $6,000,000
    175 houses damaged mainly by debris flows.
    Source: 13
59. Seventh Avenue landslide, 1969, California Highway 60, 10 miles west of Pomona, Los Angeles County.
    Cost: $3,300,000
    Source: 7, 46 (District 7)
60. Pomona landslide, 1970, Interstate Highway 10, 4 miles west of Pomona, Los Angeles County.
    Cost: $2,300,000
    Source: 46 (District 7)
61. San Bernardino landslide, 1960-1983, California Highway 330, 2.4 miles north of California Highway 30, southwestern San Bernardino County.
    Cost: (1983) $1,500,000
    Source: 46 (District 8)
62. San Francisco earthquake, 1906, Santa Cruz County.
    Fatalities: Ten in Santa Cruz Mountains near Olive Springs, 12 miles north of Santa Cruz
    Source: 57
62a. San Francisco earthquake, 1906, Monterey County.
    Fatalities: One 8 miles east of Hollister
    Source: 57
63. Bluebird Canyon landslide, 1978, Laguna Beach, California Highway 1, 9 miles north of intersection with Interstate Highway 5, Orange County.
    Cost: $20,700,000: Including 60 houses destroyed or damaged
    Source: 7, 26, 28, 49
64. San Clemente landslide, 1983, California Highway 1, 5 miles north of intersection with Interstate Highway 5, Orange County.
    Cost: Litigation involves $39,000,000
    Source: 38
65. Carlton Hills landslide, 1978, east of San Diego and west of Santee, San Diego County.
    Cost: 20 houses abandoned. Assuming each dwelling is valued at $130,000 the total cost would be $2,600,000 (included in San Diego County total).
    Source: 29
66. Van Norman Dam landslide, 1971, 17 miles north of Santa Monica, Los Angeles County.
    Costs: $73,300,000
    Source: 58
67. Juvenile Hall landslide, 1971, 18 miles north of Santa Monica, north of Interstate Highway 5, Los Angeles County.
    Cost: $64,700,000: Includes damage to buildings and transportation facilities.
    Source: 59

Table 1.--Regional damages and fatalities in Calif.

Area	Years	Damages (in millions of dollars)	Fatalities	Sources
Greater Los Angeles region				
City of Los Angeles	1978	61.1	---	11, 22, 25
	1980	48.7	---	
	1964-1996		---	
	Estimated loss for this 30-year period: $57 million in revenue due to landslide damage causing a shrinking of the real tax base. Tax declaration of loss could cost State and Federal agencies an additional $15 million.			
Los Angeles County	1978	93.3	---	22
	1980	76	---	
Los Angeles Area	1980	580	33	49
San Gabriel Mountains	1962-75	---	3	9
Santa Ana Mountains	1962-75	---	8	9
Orange County	1978	6.9	---	49
Other regional areas				
San Francisco Bay region	1968-69	60.7	0	12, 26, 34, 35, 48
	1972-73	19	0	
	1982	66	25	
Contra Costa County	1983	5.1 (public)	---	53, 54
		3.5 (private)	---	
Ventura County	1969	---	1 (due to mudflow)	15
San Diego County	1978-80	9	---	40
	Within the county there are nine landslides each with damages amounting to $1 million or more.			

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