SUMMARY OF MAJOR NATURAL DISASTER INCIDENTS IN THE U.S. 1965-85

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Graduate Program in Science, Technology, and Public Policy

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Special Publication
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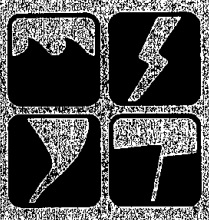

Natural Hazards Research and Applications Information Center

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INTRODUCTION, PREVIOUS DATA STUDIES, PROBLEMS ENCOUNTERED, AND RECOMMENDATIONS

Introduction

This report is designed to provide an overview of the major natural disasters that have occurred in the U.S. during the years 1965 through 1985. It is an interim product of the Study of Local Economic Effects of Natural Disasters, which is being conducted by The George Washington University Graduate Program in Science, Technology, and Public Policy. The project is supported by the National Science Foundation, under Grant No. ECE-8501986.

Originally, we intended to present a full array of data for each type of natural disaster--including the public outlay, private insurance payments, deaths, injuries, and property damage--but data problems prevented us from doing so. Those problems included lack of availability of data and fundamental inconsistencies in the data bases that were available from FEMA, the Red Cross, and the insurance industry. We created nine categories of natural disasters, which are enumerated in Table 1. Two types of disasters, fires and volcanoes, were intentionally excluded from this analysis.

We have chosen to use federally-declared disasters as the basis for this data and have relied heavily on FEMA data for the outlay of federal agencies. Federal outlay, as defined by FEMA, includes the amount spent for public assistance, temporary housing, disaster unemployment assistance, and individual and family grants.

The primary source of data on federally-declared disasters is FEMA's DMIS Report 1.1. The variables analyzed are state, FEMA contract number, date of declaration, disaster type, and federal outlay. We used the statistical computing package STATA for tabulations and then extracted the tables and transferred them to a word processing package for editing and presentation. Copies of the data on floppy disks are available at cost to researchers and others interested in working with this data set.

During the period 1965-85, the total number of disasters declared (caused by the natural events selected for this study) was 531 and total federal outlay for those disasters was approximately $6 billion in 1982 dollars, as is shown in Table 1. Obtaining a total public expenditure for each type of disaster is virtually impossible because of the difficulties in determining totals for local and state expenditures.

Both the Red Cross and the insurance industry have different definitions of a major disaster from that of FEMA, and the data from the three sources were not reconcilable. The main problem in trying to provide both damage and injury figures on one table was that the Red Cross data on deaths, injuries, and damage to dwellings is presented by fiscal year (July 1-June 30), and the other two sources produce data by calendar year. This difference made it impossible to prepare a single table with personal injury and property damage for each category of disaster. Consequently, we have provided data pertinent to each major disaster category on sequential tables where possible.

Our efforts to incorporate both federal outlay and insurance payout are contained in Tables 3B and 4A. For two types of disasters, hurricanes/tropical storms and earthquakes, we were able to achieve a reasonable match of events, so that we could compare the federal segment of public outlay and the insurance segment of the private outlay. As can be seen in Tables 3A and 4B, however, there is no consistent relationship in terms of the proportion of total expenditures for a given disaster that each sector contributes.

Previous Data Studies and Problems Encountered

This study is the latest in a series of efforts to identify and aggregate data from many sources into a useful data set and document for those interested in natural hazards incidence information. Some of the data problems identified earlier remain troublesome. An outstanding earlier effort is Natural Hazards Data Resources: Uses and Needs, edited by Susan K. Tubbesing (1979), which addressed problems in data collection at that time--problems which we also encountered in this study. First, Tubbesing noted that:

> Information pertaining to historical incidence of extreme events, their frequency, magnitude, spatial location, etc., is required by community planners to design mitigation and response plans, and by researchers in their efforts to facilitate decision-making responsibilities at all levels of government.
>
> At present, hazards data are maintained in each of more than 100 data collection agencies. This situation does little to promote access and application. To further complicate matters, these data are generally segregated by specific hazard, often causing users to locate not just one source but perhaps as many as three or more. Potential use is hindered, not so much by lack of suitable information, as by lack of awareness about where to go to obtain what is needed (p. 170).

Tubbesing recommended that the (then) new Federal Emergency Management Agency (FEMA) take on the responsibility for facilitating the exchange and use of

hazards information. However, in the seven years that FEMA has been in existence, the situation with regard to access to scattered data sources has not improved much. Tubbesing also noted that:

> In the past, agencies established data collection activities in response to their assigned missions, taking into account available manpower, time, money, and expertise at hand. The resulting collection and s t o r a g e procedures reflected these considerations and generally satisfied their mission orientation, but little thought was given to what other agencies were doing, which data were gathered, what unit of analysis was used, and what storage techniques were applied. Therefore existing data bases lack uniformity and compatibility. Even data pertaining to a common natural hazard such as flood may be collected for different purposes or periods of time by a number of different agencies. The task of comparing information over time thus becomes extremely difficult (p. 174).

We have already noted some of the problems that our team encountered in coordinating different data sources, complicated by trying to use nonfederal sources as well. The Tubbesing report also noted the difficulty in gathering data where damages are not great enough to warrant a federal disaster declaration, but are important in their implications for public policy.

A more recent effort compiled by Paula D. Gordon for FEMA in 1982, the Special Statistical Summary: Deaths, Injuries, and Property Loss by Types of Disaster 1970-1980, discusses many of the same data limitations. The study points out especially that determining economic costs and losses is highly problematic. For example, different data sources use different loss criteria; insurance company data are limited to insured property only; and the economic assumptions on which estimates are based can vary greatly. Gordon also points out that:

> differences in the defining of disaster categories make it difficult to draw easy comparisons of data. Differences in the time frame for which the data are collected, and the purposes for which they are collected, compound problems in comparative analysis and can render such attempts at analysis fruitless exercises (p. I-4).

Our study found that the problems and constraints cited above are still very real, and that there is an obvious need for a standardization of procedures for collecting data on natural hazards and for reporting the information. Until this is done, decision makers will have to deal with numerous and very diffuse sources of data, as demonstrated by the list of sources included in the last section of this report. Some rules of thumb cited by Gordon that have been confirmed by other sources are:

- Injury figures of the Red Cross have been found to be low.[1]
- Figures on economic losses are the most inexact because they are subject to a variety of errors and problems of interpretation.
- If data are sought for comparison, such as the relative losses resulting from different types of disasters, the Red Cross data are the best.
- If only one type of disaster is being researched, then other sources, such as specific government agencies, may be the best sources of data. The Tubbesing volume is still one of the best directories of where to look for data.
- Between 50 and 75% of all losses are still borne by the impacted persons.[2]
- The total cost of destruction can be estimated at 2 1/2 times the value of building losses.

In addition, in the course of trying to arrive at a total cost, we were advised by an experienced FEMA staffer that the federal outlay, which is the easiest figure to obtain, is estimated to represent less than 25% (on the average) of the total cost of a disaster. In actuality, for some disasters, the federal share is far less than 25% and for others far more. At the present time, the data problems mentioned above preclude a more thorough integration of existing data sources into a useful data base for use by practitioners and researchers.

Recommendations

We have briefly described the problems one encounters in attempting to aggregate existing disaster data and noted earlier reports on disaster data and their recommendations. The problems we encountered are not new, and many arise because each organization collecting data has a different mission. Nevertheless, we feel that the following steps would help to resolve many of the gaps, inconsistencies, and overlaps now encountered in any disaster data collection effort.

1. Review current and recent data collection efforts, such as FEMA's one-year disaster census project, and enumerate common data problems they have experienced.

---

[1]The Red Cross reports injury data only on those persons the Red Cross has actively helped; therefore, the total number of injuries connected with a disaster may be higher.

[2]According to personal communication from J.H. Wiggins.

2. Urge FEMA to collect and aggregate disaster data with attention to a specific disaster agents (e.g., earthquakes, floods).

3. Review records automation projects, such as the one now going on at the National Red Cross's Disaster Services Office, to determine if data can be extracted in a form more compatible with other sources. Specifically, the Red Cross data are provided by fiscal year and are impossible to reconcile with the calendar year data provided by FEMA and the insurance industry.

4. Begin a long-term effort to achieve cooperation and coordination among data collectors--FEMA, the Red Cross, the insurance industry--to improve ability to integrate data from each source in order to get a better idea of the total costs of disasters.

TABLE 1

FEDERALLY-DECLARED DISASTERS,
1965-1985

TYPE OF DISASTER	NUMBER	FEDERAL OUTLAY (thousands of current dollars)	FEDERAL OUTLAY (thousands of 1982 dollars)
Ice and Snow Events	19	151,427	205,511
Hurricanes/Tropical Storms	39	1,173,141	1,947,939
Earthquakes	7	203,881	405,706
Dam and Levee Failures	7	55,764	80,806
Rains, Storms & Flooding*	337	1,684,702	2,439,852
High Winds & Waves	2	125,313	120,536
Coastal Storms & Flooding	7	158,261	205,357
Tornadoes	109	441,685	648,352
Drought/Water Shortage	4	1,134	5,344
TOTALS	531	3,995,308	6,059,403

*Includes land, mud, and debris flows and slides.

Note: The Fixed-Weighted Price Index for Gross National Product was obtained from The Economic Report of the President, 1986.

Source: Federal Emergency Management Agency, DMIS Reports, 1965-1985.

TABLE 1A

SELECTED NATURAL DISASTERS: DEATHS, INJURIES, AND DAMAGE TO DWELLINGS, 1965-1985

FISCAL YEAR	NO OF EVENTS	PERSONS KILLED	PERSONS INJURED	DWELLINGS DESTROYED	DWELLINGS DAMAGED	DWELLINGS DESTROYED & DAMAGED
1965-66	135	230	26967	3538	165557	169095
1966-67	NA	114	2143	1132	31471	32603
1967-68	NA	208	15011	2303	51590	53893
1968-69	NA	127	1339	673	34277	34950
1969-70	NA	404	12388	6991	92566	99557
1970-71	152	251	7520	3392	51225	54617
1971-72	185	569	18744	8138	169781	177919
1972-73	159	174	2688	4495	90449	94944
1973-74	208	498	11123	11816	59401	71217
1974-75	203	121	1550	2459	43416	45875
1975-76	210	180	8131	8281	93371	101652
1976-77	134	243	2076	4291	42108	46399
1977-78	263	385	9346	3149	72279	75428
1978-79	310	311	8306	7966	68751	76717
1979-80	281	239	12735	10065	126377	136442
1980-81	366	NA	NA	NA	NA	65065
1981-82	368	170	6592	NA	NA	68317
1982-83	315	137	4719	NA	NA	71376
1983-84	340	244	7076	NA	NA	84945
1984-85	97	18	336	NA	NA	4541
TOTALS	--	--	--	--	--	1,565,552

Source: American National Red Cross, Annual Summaries of Disaster Services Activities, 1965-1985. Note that these data are presented by fiscal year (July 1 - June 30).

TABLE 2

FEDERALLY-DECLARED ICE AND SNOW DISASTERS,
1965-1985

FEMA #	STATE	YEAR	FEDERAL OUTLAY (in thousands)
234	NC	1968	291
282	KY	1970	349
304	FL	1971	7541
444	AK	1974	516
493	AK	1975	7435
494	NY	1976	9006
500	NE	1976	20405
524	NJ	1977	1731
525	VA	1977	1585
526	FL	1977	20283
527	NY	1977	37428
528	NJ	1977	296
536	GA	1977	231
548	RI	1978	89
696	TX	1984	24255
697	ID	1984	210
698	FL	1984	8900
732	FL	1985	10019
734	NY	1985	857
TOTAL NO = 19			151,427

Note: The total Federal Outlay in 1982 Dollars is $205,511,000. The Fixed Weighted Price Index for Gross National Product was obtained from The Economic Report of the President, 1986.

Source: Federal Emergency Management Agency, DMIS Reports, 1965-1985.

TABLE 3

FEDERALLY-DECLARED HURRICANES AND TROPICAL STORMS, 1965-1985

FEMA #	STATE	YEAR	FEDERAL OUTLAY (in thousands)
208	LA	1965	38543
209	FL	1965	1706
210	MS	1965	1783
232	TX	1967	9925
252	FL	1968	640
271	MS	1969	74524
272	LA	1969	15167
280	AL	1969	918
292	TX	1970	35808
315	LA	1971	1160
337	FL	1972	3361
338	NY	1972	98098
339	VA	1972	16815
340	PA	1972	351531
341	MD	1972	23309
344	WV	1972	1294
345	OH	1972	1453
448	LA	1974	4565
520	NY	1976	6773
521	CA	1976	8507
598	AL	1979	189893
599	MS	1979	33684
600	FL	1979	3691
627	TX	1980	31817
632	TX	1980	386
671	HI	1982	11920
689	TX	1983	40038
724	NC	1984	3460
741	MS	1985	18929
742	AL	1985	4647
743	FL	1985	13933
745	PA	1985	9233
747	CT	1985	21359
748	RI	1985	5846
749	NJ	1985	4613
750	NY	1985	38750
751	MA	1985	13862
752	LA	1985	23962
756	FL	1985	7238
TOTAL NO = 39			1,173,141

Table 3 (continued)

Note: The total Federal Outlay in 1982 Dollars is $1,947,939,000. The Fixed Weighted Price Index for Gross National Product was obtained from The Economic Report of the President, 1986.

Source: Federal Emergency Management Agency, DMIS Reports, 1965-1985.

TABLE 3A

HURRICANES: DEATHS, INJURIES, AND DAMAGE TO DWELLINGS, 1965-1985

FISCAL YEAR	NO OF EVENTS	PERSONS KILLED	PERSONS INJURED	DWELLINGS DESTROYED	DWELLINGS DAMAGED	DWELLINGS DESTROYED & DAMAGED
1965-66	5	72	25202	2059	148607	150666
1966-67	NA	0	13	6	316	322
1967-68	NA	19	11396	388	29405	29793
1968-69	NA	2	45	1	705	706
1969-70	NA	272	9062	6046	48734	54780
1970-71	5	9	4498	1887	34442	36329
1971-72	4	2	235	36	24258	24294
1972-73	0	0	0	0	0	0
1973-74	0	0	0	0	0	0
1974-75	2	3	8	45	2514	2559
1975-76	3	32	4409	4642	31670	36312
1976-77	1	2	23	15	498	513
1977-78	3	0	8	6	142	148
1978-79	1	0	0	1	3	4
1979-80	6	20	6765	6897	65033	71930
1980-81	2	NA	NA	NA	NA	14865
1981-82	1	0	0	NA	NA	3
1982-83	2	2	961	NA	NA	7454
1983-84	4	16	3094	NA	NA	18663
1984-85	0	0	0	0	0	0
TOTALS	--	--	--	--	--	449,341

Source: American National Red Cross, Annual Summaries of Disaster Services Activities, 1965-1985. Note that these data are presented by fiscal year (July 1 - June 30).

TABLE 3B

HURRICANES: PUBLIC AND PRIVATE OUTLAYS,
1965-1985

FEMA #	STATE	YEAR	FEDERAL OUTLAY (in thousands)	INSURANCE PAYMENT (in thousands)	STATES AFFECTED
208	LA	1965	38543	500000	LA,FL,MS
209	FL	1965	1706		
210	MS	1965	1783		
			42032		
232	TX	1967	9925	34800	TX
252	FL	1968	640	2580	FL
271	MS	1969	74524	165300	MS,LA,AL,FL
272	LA	1969	15167		
273	AL	1969	918		
			90609		
292	TX	1970	35808	309950	TX
315	LA	1971	1160	4730	LA,MS
337	FL	1972	3361	97853	FL,NY,VA,PA
338	NY	1972	98098		MD,WV,OH,GA
339	VA	1972	16815		SC,NC,MI,DE
340	PA	1972	351531		DC,NJ,CT,RI
341	MD	1972	23309		MA,VT,ME
344	WV	1972	1294		
345	OH	1972	1453		
			495861		
448	LA	1974	4565	14721	LA
520	NY	1976	6773	22697	NY,NJ,CT,MA
521	CA	1976	8507	NA	--
598	AL	1979	189893	752510	AL,MS,FL,GA
599	MS	1979	33684		SC,NC,VA,MD
600	FL	1979	3691		DC,DE,PA,NJ
			227268		NY,CT,MA
627	TX	1980	31817	57911	TX
632	TX	1980	386	NA	--

Table 3B (continued)

671	HI	1982	11920	137000	HI
689	TX	1983	40038	675520	TX
724	NC	1984	3460	36000	NC,SC
741	MS	1985	18929	543304	MS,AL,FL,LA
742	AL	1985	4647		
743	FL	1985	13933		
			37509		
745	PA	1985	9233	418750	PA,CT,RI,NJ
747	CT	1985	21359		NY,MA,NC,VA
748	RI	1985	5846		MD,DE,NH,VT
749	NJ	1985	4613		ME
750	NY	1985	38750		
751	MA	1985	13862		
			93663		
752	LA	1985	23962	44000	LA,MS,AL,FL
756	FL	1985	7238	77600	FL,GA
TOTAL NO = 39			1,173,141	3,895,226	

Sources: Federal Emergency Management Agency, DMIS Reports, 1965-1985, and Property Claim Services, Catastrophe Statistical Record, 1965-1985.

TABLE 4

FEDERALLY-DECLARED EARTHQUAKES,
1965-1985

FEMA #	STATE	YEAR	FEDERAL OUTLAY (in thousands)
196	WA	1965	1182
299	CA	1971	186930
383	HI	1973	1553
490	HI	1975	917
609	CA	1979	8157
682	CA	1983	4174
694	ID	1983	968
TOTAL NO = 7			203,881

Note: The total Federal Outlay in 1982 Dollars is $405,706,000. The Fixed-Weighted Price Index for Gross National Product was obtained from The Economic Report of the President, 1986.

Source: Federal Emergency Management Agency, DMIS Reports, 1965-1985.

TABLE 4A

EARTHQUAKES: PUBLIC AND PRIVATE OUTLAYS,
1965-1985

FEMA #	STATE	YEAR	FEDERAL OUTLAY (in thousands)	INSURANCE PAYMENT (in thousands)	STATES AFFECTED
196	WA	1965	1182	NA	--
299	CA	1971	186930	31600	CA
383	HI	1973	1553	NA	--
490	HI	1975	917	NA	--
609	CA	1979	8157	2500	CA
682	CA	1983	4174	10000	CA
694	ID	1983	968	NA	--
TOTAL NO = 7			203,881	--	--

Sources: Federal Emergency Management Agency, DMIS Reports, 1965-1985, and Property Claim Services, Catastrophe Statistical Record, 1965-1985.

TABLE 5

FEDERALLY-DECLARED DAM AND LEVEE FAILURES,
1965-1985

FEMA #	STATE	YEAR	FEDERAL OUTLAY (in thousands)
342	CA	1972	4881
379	CO	1973	639
505	ID	1976	33327
541	GA	1977	2443
633	CA	1980	4080
665	CO	1982	1420
669	CA	1982	8974
TOTAL NO = 7			55,764

Note: The total Federal Outlay in 1982 Dollars is $80,806,000. The Fixed-Weighted Price Index for Gross National Product was obtained from The Economic Report of the President, 1986.

Source: Federal Emergency Management Agency, DMIS Reports, 1965-1985.

TABLE 6

FEDERALLY-DECLARED RAINS, STORMS, AND FLOODING,
1965-1985*

FEMA #	STATE	YEAR	FEDERAL OUTLAY (in thousands)
187	NV	1965	956
188	MN	1965	9589
193	IA	1965	4432
195	ND	1965	307
197	SD	1965	587
198	MO	1965	432
201	KS	1965	1021
202	NM	1965	2328
203	MO	1965	1303
211	CA	1965	2000
212	CA	1966	328
214	GA	1966	249
215	MN	1966	1385
216	ND	1966	934
217	AZ	1966	2801
218	TX	1966	429
220	ND	1966	382
221	NE	1966	635
222	TX	1966	62
223	CA	1967	6379
224	WV	1967	323
226	KY	1967	383
228	NE	1967	927
230	AK	1967	7328
233	NY	1967	463
241	OK	1968	146
243	OH	1968	276
244	TX	1968	68
245	NJ	1968	1223
246	TX	1968	183
247	IN	1968	148
248	IA	1968	505
249	MN	1968	437
250	MN	1968	176
251	HI	1968	219
253	CA	1969	83780
254	AR	1969	304
255	MN	1969	4612
256	ND	1969	3503
257	SD	1969	792
258	NV	1969	999
259	IA	1969	1574

Table 6 (continued)

260	WI	1969	351
261	CO	1969	3178
262	IL	1969	666
263	TN	1969	534
264	WI	1969	354
265	KY	1969	151
268	MN	1969	147
269	IA	1969	1233
270	CA	1969	2346
273	PA	1969	950
274	VA	1969	8458
275	NY	1969	441
276	IL	1969	2264
277	VT	1969	288
278	WV	1969	155
279	WV	1969	21
281	AK	1969	93
283	CA	1970	6034
284	ME	1970	3129
287	ND	1970	1663
288	KY	1970	108
289	FL	1970	488
290	NY	1970	740
291	MN	1970	3708
293	CO	1970	605
294	AZ	1970	1609
300	WA	1971	1640
301	OR	1971	647
303	NE	1971	1440
308	NE	1971	253
309	MD	1971	2838
310	NJ	1971	11177
311	NY	1971	4171
312	PA	1971	4551
313	TX	1971	5083
314	OK	1971	420
316	CA	1972	557
317	OK	1972	422
318	MS	1972	594
319	OR	1972	6924
320	TX	1972	173
321	AR	1972	347
322	WA	1972	1750
323	WV	1972	6336
324	ID	1972	389
325	MA	1972	6741
326	ME	1972	850
328	WA	1972	1902
329	CA	1972	2263
330	MI	1972	1134
331	TN	1972	300
332	KY	1972	411

Table 6 (continued)

333	TX	1972	2277
334	WA	1972	3022
335	ND	1972	233
336	SD	1972	23121
343	AZ	1972	406
346	NM	1972	49
347	MN	1972	1855
348	IA	1972	520
349	WV	1972	3148
350	MN	1972	3280
351	IL	1972	920
352	WI	1972	403
353	NM	1972	525
354	IA	1972	665
355	PA	1972	150
358	VA	1972	834
359	VA	1972	931
360	AZ	1972	2856
361	NM	1972	512
362	OH	1972	766
363	MI	1972	412
364	CA	1973	4384
366	TN	1973	3797
371	MI	1973	1460
373	IL	1973	16737
374	LA	1973	13048
375	AR	1973	4485
376	WI	1973	2802
377	OH	1973	1640
378	KS	1973	1936
380	NM	1973	1428
381	KY	1973	342
382	TN	1973	1074
384	ME	1973	908
385	CO	1973	4747
386	IA	1973	1484
387	FL	1973	563
388	AL	1973	3699
389	AR	1973	1288
390	OH	1973	1500
393	TX	1973	1227
394	NC	1973	378
395	TN	1973	1911
396	CO	1973	990
397	VT	1973	13202
398	TX	1973	1846
399	NH	1973	3701
400	PA	1973	5157
401	NY	1973	2812
402	NJ	1973	4146
404	OK	1973	4166
406	NE	1973	1664

Table 6 (continued)

407	MO	1973	1680
408	AK	1973	1646
409	OK	1973	546
410	ME	1974	1812
411	NH	1974	298
412	CA	1974	6907
413	OR	1974	4681
414	WA	1974	2123
415	ID	1974	2829
416	WV	1974	149
417	MT	1974	870
418	LA	1974	1721
419	OK	1974	327
426	WV	1974	26
430	MS	1974	3759
432	CA	1974	1747
433	HI	1974	60
434	ND	1974	1608
435	AR	1974	380
436	OH	1974	1043
437	AR	1974	2628
438	IL	1974	7617
439	MO	1974	3059
440	MN	1974	1798
441	OK	1974	3394
442	KS	1974	292
443	IA	1974	2782
445	OH	1974	799
446	MN	1974	754
447	NY	1974	1818
450	LA	1974	279
452	AK	1974	2792
453	OK	1974	1895
454	TX	1974	1854
457	TX	1975	440
458	AL	1975	1525
459	TN	1975	5876
461	KY	1975	1686
464	AL	1975	1189
465	MI	1975	4084
468	KY	1975	1996
469	ND	1975	1470
471	AR	1975	379
472	MT	1975	2994
473	MN	1975	168
475	ND	1975	4740
479	FL	1975	912
481	WV	1975	4775
486	MI	1975	662
487	NY	1975	6007
489	MD	1975	2257
492	WA	1975	6559

Table 6 (continued)

496	WI	1976	5848
501	ND	1976	3598
504	OK	1976	738
507	GA	1976	619
510	TX	1976	8116
511	SD	1976	1247
512	NY	1976	1115
513	PA	1976	2641
514	KS	1976	1802
515	NY	1976	2437
516	MO	1976	504
517	CO	1976	12083
518	VT	1976	8201
519	NJ	1976	3476
522	MD	1976	1357
523	PA	1976	6353
529	KY	1977	69780
530	VA	1977	29321
531	WV	1977	45863
532	AL	1977	1877
533	TN	1977	2304
534	LA	1977	2253
537	PA	1977	128933
538	MO	1977	14357
539	KS	1977	3908
540	AZ	1977	2203
542	NC	1977	18086
543	VA	1977	3874
544	TN	1977	3422
545	WA	1977	3941
551	AZ	1978	10551
552	NE	1978	4351
553	IN	1978	1675
554	ND	1978	3414
555	MN	1978	2095
556	LA	1978	8745
557	WY	1978	1619
558	MT	1978	5789
561	TX	1978	12105
563	AL	1978	482
564	AR	1978	1843
565	LA	1978	974
566	CA	1978	1769
568	KY	1978	9399
569	WV	1978	6031
570	AZ	1978	22919
571	NM	1979	2363
573	HI	1979	1338
578	AL	1979	5729
581	ND	1979	19422
582	MN	1979	6300
583	IL	1979	11888

Table 6 (continued)

584	LA	1979	2539
587	TX	1979	75
588	KS	1979	1038
589	NM	1979	2302
592	KY	1979	3071
593	VA	1979	3633
594	CA	1979	2112
595	TX	1979	8363
596	IN	1979	2433
603	TX	1979	2627
604	LA	1979	572
605	NC	1979	257
606	VA	1979	552
607	FL	1979	378
612	WA	1979	218
613	HI	1980	2387
614	AZ	1980	13622
615	CA	1980	114313
616	LA	1980	2577
622	LA	1980	2494
626	WI	1980	2327
628	WV	1980	6752
629	PA	1980	3795
630	OH	1980	2403
631	MI	1980	7430
639	AL	1981	3665
640	MT	1981	4581
641	PA	1981	4900
645	NV	1981	188
646	TX	1981	603
648	TX	1981	3529
649	OK	1981	2113
651	CA	1982	33671
652	IN	1982	6827
653	OH	1982	442
654	MI	1982	149
655	TX	1982	1650
656	HI	1982	1163
658	ND	1982	358
659	TX	1982	889
661	CT	1982	15283
662	OK	1982	3270
663	KS	1982	783
664	FL	1982	812
666	TN	1982	1998
667	MO	1982	3209
668	TN	1982	779
670	KY	1982	382
672	MO	1982	14802
675	LA	1983	3045
676	WA	1983	1427
679	LA	1983	8331

Table 6 (continued)

680	UT	1983	42106
685	OK	1983	453
686	AZ	1983	6321
687	CA	1983	1559
688	AR	1983	878
690	CA	1983	2356
691	AZ	1983	18711
692	NM	1983	826
693	OK	1983	6148
706	WV	1984	4178
707	VA	1984	3133
708	TN	1984	1454
709	OK	1984	6272
711	CT	1984	2204
712	VT	1984	4295
713	MO	1984	3712
717	SD	1984	2691
719	CO	1984	5099
720	UT	1984	13592
721	PA	1984	5889
722	NM	1984	827
723	NV	1984	3910
725	NY	1984	2978
726	TX	1984	3169
727	TX	1984	3210
728	LA	1984	1119
730	AZ	1985	735
731	NM	1985	1306
733	NY	1985	1287
735	IL	1985	3821
740	WY	1985	3200
744	MI	1985	4608
753	WV	1985	114319
754	PA	1985	7894
755	VA	1985	47138
TOTAL NO = 337			1,684,702

*Includes land, mud, and debris flows and slides.

Note: The total Federal Outlay in 1982 Dollars is $2,439,852,000. The Fixed-Weighted Price Index for Gross National Product was obtained from The Economic Report of the President, 1986.

Source: Federal Emergency Management Agency, DMIS Reports, 1965-1985.

TABLE 6A

FLOODS: DEATHS, INJURIES, AND DAMAGE TO DWELLINGS, 1965-1985

FISCAL YEAR	NO OF EVENTS	PERSONS KILLED	PERSONS INJURED	DWELLINGS DESTROYED	DWELLINGS DAMAGED	DWELLINGS DESTROYED & DAMAGED
1965-66	67	22	102	91	9131	9222
1966-67	NA	16	161	108	22353	22461
1967-68	NA	38	824	84	14224	14308
1968-69	NA	24	284	71	17674	17745
1969-70	NA	51	783	83	33769	33852
1970-71	49	22	58	105	6993	7098
1971-72	77	519	16587	7346	133805	141151
1972-73	78	105	1559	3229	81467	84696
1973-74	83	71	366	1417	31309	32726
1974-75	90	48	500	803	25008	25811
1975-76	70	55	2071	1377	26179	27556
1976-77	58	165	1469	3581	35942	39523
1977-78	106	196	3712	1489	48508	49997
1978-79	148	143	3842	2659	56646	59305
1979-80	122	79	1121	887	37439	38326
1980-81	115	NA	NA	NA	NA	19578
1981-82	133	70	2561	NA	NA	46256
1982-83	149	69	1988	NA	NA	48874
1983-84	121	65	1478	NA	NA	41578
1984-85	48	9	29	NA	NA	2308
TOTALS	--	--	--	--	--	762,371

Source: American National Red Cross, Annual Summaries of Disaster Services Activities, 1965-1985. Note that these data are presented by fiscal year (July 1 - June 30).

TABLE 6B

STORMS: DEATHS, INJURIES, AND DAMAGE TO DWELLINGS, 1965-1985

FISCAL YEAR	NO OF EVENTS	PERSONS KILLED	PERSONS INJURED	DWELLINGS DESTROYED	DWELLINGS DAMAGED	DWELLINGS DESTROYED & DAMAGED
1965-66	20	42	54	8	1226	1234
1966-67	NA	8	43	23	1723	1746
1967-68	NA	12	78	298	1214	1512
1968-69	NA	51	242	276	11331	11607
1969-70	NA	3	22	21	3950	3971
1970-71	27	2	71	117	1207	1324
1971-72	31	14	1165	424	9287	9711
1972-73	19	1	72	104	4687	4791
1973-74	26	8	106	113	1589	1702
1974-75	37	7	336	238	7600	7838
1975-76	39	44	387	610	28080	28690
1976-77	24	54	187	106	2662	2768
1977-78	78	164	5096	476	17105	17581
1978-79	80	6	127	144	1892	2036
1979-80	56	22	2995	668	16285	16953
1980-81	60	NA	NA	NA	NA	21885
1981-82	97	24	2805	NA	NA	10746
1982-83	55	19	421	NA	NA	6725
1983-84	71	19	188	NA	NA	5774
1984-85	11	2	25	NA	NA	438
TOTALS	--	--	--	--	--	159,032

Source: American National Red Cross, Annual Summaries of Disaster Services Activities, 1965-1985. Note that these data are presented by fiscal year (July 1 - June 30).

TABLE 7

FEDERALLY-DECLARED HIGH WINDS AND WAVES,
1965-1985

FEMA #	STATE	YEAR	FEDERAL OUTLAY (in thousands)
367	NY	1973	1115
677	CA	1983	124198
TOTAL NO = 2			125,313

Note: The total Federal Outlay in 1982 Dollars is $120,536,000. The Fixed-Weighted Price Index for Gross National Product was obtained from The Economic Report of the President, 1986.

Source: Federal Emergency Management Agency, DMIS Reports, 1965-1985.

TABLE 8

FEDERALLY-DECLARED COASTAL STORMS AND FLOODING,
1965-1985

FEMA #	STATE	YEAR	FEDERAL OUTLAY (in thousands)
327	NH	1972	272
546	MA	1978	36975
547	CA	1978	90919
549	NH	1978	410
550	ME	1978	2140
701	NJ	1984	15990
702	NY	1984	11555
TOTAL NO = 7			158,261

Note: The total Federal Outlay in 1982 Dollars is $205,357,000. The Fixed-Weighted Price Index for Gross National Product was obtained from The Economic Report of the President, 1986.

Source: Federal Emergency Management Agency, DMIS Reports, 1965-1985.

TABLE 9

FEDERALLY-DECLARED TORNADOES,
1965-1985

FEMA #	STATE	YEAR	FEDERAL OUTLAY (in thousands)
189	IN	1965	1426
190	MI	1965	1177
191	OH	1965	192
192	WI	1965	627
194	IL	1965	3045
199	TX	1965	289
200	CO	1965	14206
219	KS	1966	2797
227	IL	1967	205
229	KS	1967	830
236	AR	1968	224
237	KY	1968	53
238	OH	1968	114
239	AR	1968	349
240	IA	1968	472
242	IL	1968	247
266	OH	1969	4229
267	KS	1969	716
285	AL	1970	120
286	TX	1970	5475
297	OK	1970	461
302	MS	1971	4248
305	KY	1971	212
306	TN	1971	204
365	TX	1973	616
368	MS	1973	8013
369	AL	1973	1871
370	GA	1973	1107
372	MO	1973	17754
391	GA	1973	285
392	OK	1973	1837
403	KS	1973	4134
420	KY	1974	12575
421	OH	1974	18370
422	AL	1974	7326
423	IN	1974	11384
424	TN	1974	3292
425	GA	1974	424
427	IL	1974	139
428	NC	1974	215
429	MI	1974	102
431	WI	1974	109

Table 9 (continued)

456	MS	1975	638
460	GA	1975	1069
462	TX	1975	298
463	AR	1975	464
466	MO	1975	393
467	NE	1975	3018
470	LA	1975	3710
474	OK	1975	1112
476	MN	1975	4207
477	NJ	1975	5875
478	IL	1975	605
480	OH	1975	4090
482	WI	1975	625
484	FL	1975	5220
485	PA	1975	29062
488	AL	1975	5642
491	OK	1975	302
495	MI	1976	8563
497	OK	1976	291
498	AR	1976	411
499	MS	1976	1000
509	IL	1976	1280
535	MO	1977	1318
559	WI	1978	6386
560	MN	1978	10529
567	LA	1978	889
574	AR	1979	1862
575	TX	1979	36003
576	OK	1979	854
577	MS	1979	31354
579	MO	1979	7836
580	TX	1979	4148
585	TN	1979	4766
586	FL	1979	938
590	IA	1979	1373
591	WY	1979	468
601	MD	1979	10696
608	CT	1979	952
617	AR	1980	128
618	MS	1980	3408
619	AL	1980	4604
620	MO	1980	137
621	MI	1980	541
625	NE	1980	5103
638	AL	1981	453
642	OH	1981	1019
643	IL	1981	2130
644	KS	1981	651
660	IL	1982	890
673	AR	1982	9471
674	IL	1982	6442
678	MS	1983	5675

Table 9 (continued)

683	MS	1983	2877
684	IL	1983	4302
695	AL	1983	3440
699	NC	1984	5902
700	SC	1984	3121
703	MS	1984	1243
704	OK	1984	2405
705	KY	1984	21333
710	WI	1984	1138
711	KS	1984	4569
715	IA	1984	2998
716	NE	1984	6397
718	NE	1984	245
737	PA	1985	8340
738	OH	1985	2900
TOTAL NO = 109			441,685

Note: The total Federal Outlay in 1982 Dollars is $648,352,000. The Fixed-Weighted Price Index for Gross National Product was obtained from The Economic Report of the President, 1986.

Source: Federal Emergency Management Agency, DMIS Reports, 1965-1985.

TABLE 9A

TORNADOES: DEATHS, INJURIES, AND DAMAGE TO DWELLINGS, 1965-1985

FISCAL YEAR	NO OF EVENTS	PERSONS KILLED	PERSONS INJURED	DWELLINGS DESTROYED	DWELLINGS DAMAGED	DWELLINGS DESTROYED & DAMAGED
1965-66	36	92	1606	1357	6578	7935
1966-67	NA	90	1926	995	7079	8074
1967-68	NA	139	2713	1533	6747	8280
1968-69	NA	50	768	325	4567	4892
1969-70	NA	78	2521	841	6113	6954
1970-71	62	145	1823	1191	5225	6416
1971-72	57	22	653	332	2429	2761
1972-73	41	31	993	1135	4068	5203
1973-74	89	412	10574	10283	26478	36761
1974-75	54	48	688	1367	7716	9083
1975-76	74	40	1213	1609	6476	8085
1976-77	37	11	369	589	2942	3531
1977-78	49	21	448	1153	6310	7463
1978-79	44	100	4209	5112	9717	14829
1979-80	59	26	1042	1436	6234	7670
1980-81	70	NA	NA	NA	NA	8171
1981-82	65	52	1158	NA	NA	11145
1982-83	53	27	437	NA	NA	6182
1983-84	80	136	2160	NA	NA	17573
1984-85	21	6	243	NA	NA	1742
TOTALS	--	--	--	--	--	182,750

Source: American National Red Cross, Annual Summaries of Disaster Services Activities, 1965-1985. Note that these data are presented by fiscal year (July 1 - June 30).

TABLE 10

FEDERALLY-DECLARED DROUGHT/WATER SHORTAGE,
1965-1985

FEMA #	STATE	YEAR	FEDERAL OUTLAY (in thousands)
204	NY	1965	0
205	NJ	1965	1009
206	PA	1965	125
207	DE	1965	0
TOTAL NO = 4			1,134

Note: The total Federal Outlay in 1982 dollars is $5,344,000. The Fixed-Weighted Price Index for Gross National Product was obtained from The Economic Report of the President, 1986.

Source: Federal Emergency Management Agency, DMIS Reports, 1965-1985.

TABLE 11

OTHER NATURAL DISASTERS: DEATHS, INJURIES, AND DAMAGE TO DWELLINGS, 1965-1985

FISCAL YEAR	NO OF EVENTS	PERSONS KILLED	PERSONS INJURED	DWELLINGS DESTROYED	DWELLINGS DAMAGED	DWELLINGS DESTROYED & DAMAGED
1965-66	7	2	3	23	15	38
1966-67	NA	NA	NA	NA	NA	NA
1967-68	NA	NA	NA	NA	NA	NA
1968-69	NA	NA	NA	NA	NA	NA
1969-70	NA	NA	NA	NA	NA	NA
1970-71	9	73	1070	92	3358	3450
1971-72	16	12	104	0	2	2
1972-73	21	37	64	27	227	254
1973-74	10	7	77	3	25	28
1974-75	20	15	18	6	578	584
1975-76	24	9	51	43	96	139
1979-80	38	92	812	177	1388	1565
1980-81	119	NA	NA	NA	NA	566
1981-82	72	24	68	NA	NA	167
1982-83	56	20	912	NA	NA	2141
1983-84	64	8	156	NA	NA	1357
1984-85	17	1	39	NA	NA	53
TOTALS	--	--	--	--	--	--

Source: Federal Emergency Management Agency, DMIS Reports, 1965-1985.

SOURCES OF INCIDENCE DATA
FOR SELECTED NATURAL DISASTERS
PUBLICATIONS AND AGENCIES

GENERAL

American National Red Cross. Annual Summary of Disaster Services Activities. Washington, D.C. Published annually 1965-1985.

Lists deaths, injuries, number of dwellings destroyed for disasters in which the Red Cross is involved, by fiscal year (July 1 - June 30). Broken down by hurricanes, tornadoes, windstorms, floods/flash floods, and other (including earthquakes).

Federal Emergency Management Agency (FEMA). DMIS (Disaster Management Information System) Reports. Washington, D.C. Compiled annually.

DMIS Report 1.1 is a computer printout of several categories of information about Prsidentially-declared disasters. The list is not published or distributed; it is primarily used in-house by FEMA staff. For each declared disaster, data include the number and date of the declaration, the names of the counties affected, total federal outlay (which includes not only FEMA's Individual and Public Assistance Programs but also the expenditures by the Small Business Administration and the Farmers Home Administration). A copy of a segment of the printout (e.g., for a two-year period) can be requested from FEMA central or regional offices. At the time of this study, the person to contact at the central office is Joseph Russell, Federal Response Coordination Branch, FEMA, 500 C Street, S.W., Washington, D.C. 20472, (202) 646-3069.

Federal Emergency Management Agency (FEMA). Emergency Hazards in the U.S.: National Incidence and Impacts. Washington, D.C. 1985.

Includes:
Appendix C: Major Federal Information Sources
Appendix D: Private Organization Sources
Appendix E: Additional Agency Sources
Appendix F: Bibliography

Covers floods; thunderstorms, lightning, tornadoes, hurricanes; extreme temperatures; droughts; and earthquakes.

Federal Emergency Management Agency (FEMA), Federal Insurance Administration, Office of Insurance Support Services, 500 C Street, S.W., Washington, D.C. 20472.

Provides information about the cost of flood disasters in terms of the amount paid in insurance claims and the amount paid in insurance policy premiums. At the time of this study, the person to contact is James Taylor, (202) 646-2777.

Federal Emergency Management Agency (FEMA). Special Statistical Summary: Deaths, Injuries, and Property Loss by Type of Disaster 1970-1980, compiled by Paula D. Gordon. Washington, D.C. 1982.

Provides the indicated historical data.

Insurance Information Institute. 1985-86 Property/Casualty Fact Book. New York. 1984.

For earthquakes, tornadoes, and hurricanes, lists date, place, type of catastrophe, estimated loss payments.

Petak, William J., Arthur A. Atkinson, and Paul H. Gleye. Natural Hazard Risk Assessment and Public Policy. New York: Springer-Verlag. 1982. See also the earlier volume by the same authors, Natural Hazards: A Public Policy Assessment. Redondo Beach, California: J.H. Wiggins Company. 1978 (out of print).

Analyzes nine hazard categories: earthquake, landslide, expansive soil, riverine flood, hurricane wind/storm surge, tornado, local flood, local wind, and tsunami; and provides statistics on deaths and property loss amounts (buildings and contents), housing units lost, person-years of homelessness and unemployment, income loss amounts (business and individual). Data are all for 1970 with extrapolations to 2000.

Property Claim Services. Catastrophe Statistical Record, 1965-1985. Rahway, New Jersey. Published quarterly.

Provides data on insured property damage. Also estimated losses for occurrences such as flooding, earthquake, earth movement or for property not normally covered by the private insurance market such as growing crops, timber lands, beaches, infrastructure, major utilities, ocean marine facilities. (On January 1, 1982 the threshold for reporting catastrophes was increased from $1 million to $5 million.)

Tubbesing, Susan K., Editor. Natural Hazards Data Resources: Uses and Needs. Boulder, Colorado: University of Colorado, Institute of Behavioral Science. 1979 (out of print). Now available from the National Technical Information Service, U.S. Department of Commerce, Springfield, Virginia 22161 as report #PB 194 212.)

Still one of the best compilations of data sources.

U.S. Department of Agriculture. Agricultural Statistics. Washington, D.C. Published annually.

Lists percentage of crop losses by hazard (drought, hail, excess moisture, freezing, flood, wind, etc.)

U.S. Department of Agriculture, Federal Crop Insurance Corporation, 14th and Independence Avenue, S.W., (South Building), Washington, D.C., (202) 447-3287.

Maintains data bases or computerized records that include material on emergency disaster assistance, emergency loan distribution, insurance paid out for crop losses, avalanches, hail, and drought.

U.S. Department of Commerce, National Oceanic and Atmospheric Administration (NOAA), National Environmental Satellite, Data, and Information Service, Assessment and Information Services Center. Climate Impact Assessment. Washington, D.C. Summaries published annually.

Includes floods, storms, lightning, hurricanes, extreme temperatures, and other natural hazards and their impacts on people, property, agriculture.

U.S. Department of Commerce, National Oceanic and Atmospheric Administration (NOAA), National Environmental Satellite, Data, and Information Service, National Climatic Data Center. Climatological Data (National Annual Summary), 1965-1980. Asheville, North Carolina.

At the time of this study, the person to contact at the NOAA Library is Mrs. Littlejohn, (301) 443-8334.

U.S. Department of Commerce, National Oceanic and Atmospheric Administration (NOAA), National Environmental Satellite, Data, and Information Service, National Climatic Data Center. Storm Data (December issues), 1981-1985. Asheville, North Carolina.

U.S. Small Business Administration (SBA), Disaster Assistance and Data Sections, 1441 L Street, N.W., Washington, D.C. 20416.

At the time of this study the person to contact is Jerry Fico, (202) 653-6375. The agency maintains data on location, type of disaster, number and dollar amount of disaster loans--including home, business, and economic injury disaster loans.

Annotations for most of the following entries are included in the GENERAL category.

SNOW, SNOWMELT, ICING, ICE JAMS

Federal Emergency Management Agency (FEMA). Emergency Hazards in the U.S.: National Incidence and Impacts. Washington, D.C. 1985.

Covered under the category of "extreme temperatures."

See also GENERAL and FLOODING categories.

HURRICANES/TROPICAL STORMS

American National Red Cross. Annual Summary of Disaster Services Activities. Washington, D.C. Published annually 1965-1985.

Federal Emergency Management Agency (FEMA). DMIS (Disaster Management Information System) Reports. Washington, D.C. Compiled annually.

Federal Emergency Management Agency (FEMA). Emergency Hazards in the U.S.: National Incidence and Impacts. Washington, D.C. 1985.

Insurance Information Institute. 1985-86 Property/Casualty Fact Book. New York. 1984.

Petak, William J., Arthur A. Atkinson, and Paul H. Gleye. Natural Hazard Risk Assessment and Public Policy. New York: Springer-Verlag. 1982. See also the earlier volume by the same authors, Natural Hazards: A Public Policy Assessment. Redondo Beach, California: J.H. Wiggins Company. 1978 (out of print).

Property Claim Services. Catastrophe Statistical Record, 1965-1985. Rahway, New Jersey. Published quarterly.

U.S. Department of Commerce, National Oceanic and Atmospheric Administration (NOAA), National Hurricane Center. The Deadliest, Costliest, and Most Intense U.S. Hurricanes of This Century (and Other Frequently Requested Hurricane Facts). Coral Gables, Florida. 1983.

The Hurricane Center's address is 1320 South Dixie Highway, Coral Gables, Florida 33146, (305) 666-4612.

U.S. Department of Commerce, National Oceanic and Atmospheric Administration (NOAA), National Environmental Satellite, Data, and Information Service, National Climatic Data Center. Tropical Cyclones of the N. Atlantic Ocean, 1871-1980. Asheville, North Carolina: Published jointly by the National Climatic Data Center and the National Hurricane Center. 1981.

Classifies and discusses data sources; gives tracks and frequencies and intensities of hurricanes, but no damage figures.

EARTHQUAKES

American National Red Cross. Annual Summary of Disaster Services Activities. Washington, D.C. Published annually 1965-1985.

Federal Emergency Management Agency (FEMA). DMIS (Disaster Management Information System) Reports. Washington, D.C. Compiled annually.

Federal Emergency Management Agency (FEMA). Emergency Hazards in the U.S.: National Incidence and Impacts. Washington, D.C. 1985.

Insurance Information Institute. 1985-86 Property/Casualty Fact Book. New York. 1984.

Petak, William J., Arthur A. Atkinson, and Paul H. Gleye. Natural Hazard Risk Assessment and Public Policy. New York: Springer-Verlag. 1982. See also the earlier volume by the same authors, Natural Hazards: A Public Policy Assessment. Redondo Beach, California: J.H. Wiggins Company. 1978 (out of print).

Property Claim Services. Catastrophe Statistical Record, 1965-1985. Rahway, New Jersey. Published quarterly.

U.S. Department of the Interior, United States Geological Survey, National Earthquake Information Center, MS 967, Box 25046, Denver, Colorado 80225, (303) 236-1500.

Historic Data:

U.S. Department of the Interior, United States Geological Survey. Catalog of Significant Earthquakes, 2000 B.C.-1979, Including Quantitative Casualties and Damage. Washington, D.C. 1981.

U.S. Department of the Interior, United States Geological Survey (with NOAA). Earthquake History of the United States. Boulder, Colorado. 1982.

U.S. Department of the Interior, United States Geological Survey, Geologic Division. National Earthquake Catalog Database (NEQCAT).

The USGS Office of Earthquakes, Volcanoes, and Engineering is located at 345 Middlefield Road, MS 922, Menlo Park, California 94025, (415) 323-8111.

DAM COLLAPSE

American Society of Civil Engineers (ASCE). Lessons from Dam Incidents U.S.A. New York: Published jointly by ASCE and U.S. Committee on Large Dams. 1975.

Lists number of dam incidents by type 1965-73 (and earlier), but no information on deaths, injuries, or property damage. ASCE's address is 345 East 47th Street, New York, New York 10017.

Federal Emergency Management Agency (FEMA), State and Local Programs Support, Office of Natural and Technological Hazards Programs, 500 C Street, S.W., Washington, D.C. 20472.

At the time of this study the person to contact is William Bivins, (202) 646-2817.

LANDSLIDES, SLIDES, MUDSLIDES, MUDFLOWS

U.S. Department of the Interior, United States Geological Survey, Landslide Information Center, MS 966, Box 25046, Denver, Colorado 80225, (303) 236-1599.

U.S. Department of the Interior, United States Geological Survey. Bibliography of U.S. Landslide Maps and Reports, compiled by Christopher S. Alger and Earl E. Brabb. Menlo Park, California. 1985.

FLOODING

American National Red Cross. Annual Summary of Disaster Services Activities. Washington, D.C. Published annually 1965-1985.

Federal Emergency Management Agency (FEMA). DMIS (Disaster Management Information System) Reports. Washington, D.C. Compiled annually.

Federal Emergency Management Agency (FEMA). Emergency Hazards in the U.S.: National Incidence and Impacts. Washington, D.C. 1985.

Federal Emergency Management Agency (FEMA), National Flood Insurance Program, Underwriting Policy and Program Statistics Division, 500 C Street, S.W., Washington, D.C. 20472.

At the time of this study the division chief is James Cochrane, (202) 646-3433.

Insurance Information Institute. 1985-86 Property/Casualty Fact Book. New York. 1984.

Property Claim Services. Catastrophe Statistical Record, 1965-1985. Rahway, New Jersey. Published quarterly.

U.S. Department of Commerce, National Oceanic and Atmospheric Administration (NOAA), National Weather Service, Office of Hydrology, Hydrological Services Division 8060 13th Street, Silver Spring, Maryland 20910, (301) 427-7624.

Provides estimated annual loss of life and property due to floods.

HAIL

See GENERAL category.

HIGH WINDS

American National Red Cross. Annual Summary of Disaster Services Activities. Washington, D.C. Published annually 1965-1985.

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