

*HOW MANY PEOPLE
ARE KILLED BY
LIGHTNING EACH YEAR?*

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Although no exact figures on lightning fatalities are available — there is no central agency to which lightning accidents must be reported—various studies (Refs. 3.1, 3.2, 3.3, 3.4) have placed the average annual number of deaths in the U.S. at 100, 137, 151, 300, and even 600. Whatever the exact number, lightning causes more direct deaths than any other weather phenomena. Snowstorms cause more indirect deaths (e.g., heart attacks from shoveling the driveway). Tornadoes cause about half as many deaths as lightning but inflict much more property damage. It is perhaps surprising that about two-thirds of the people involved in lightning accidents subsequently make a complete recovery. Most, if not all, of these survivors are prob-

ably not directly struck by lightning, but rather receive electrical shock from being in the close vicinity of a strike.

About 70% of all fatal lightning accidents involve one person, about 15% occur in groups of two, the remainder involves three or more deaths per lightning event. Between 75 and 85% of all lightning deaths and injuries are to men, probably because they are more likely to be out-of-doors. About 70% of all injuries and fatalities occur in the afternoon, about 20% between 6 p.m. and midnight (Ref. 3.1).

The largest single category of lightning deaths (12 to 15% of all fatalities) is composed of those unfortunate individuals who seek refuge under trees during thunderstorms and have their sheltering trees struck by lightning. Perhaps one-third of these are golfers. Two additional categories in which large numbers of lightning fatalities occur are designated "Open Water" and "Tractors", each claiming about 10% of the total fatalities. "Open Water" includes people fishing, swimming, on beaches, piers, and levees, in boats, and on water skis; "Tractors" includes people on, in, or near farm tractors or other implements, construction equipment, cars, and trucks (Refs. 3.1, 3.3).

Most lightning deaths occur outdoors. Over 30% of all lightning deaths involve people who work outdoors; over 25% of all deaths involve outdoor recreationists. A breakdown of deaths and injuries to farmers and ranchers and to outdoor recreationists for the 20-year period 1950 through 1969 is given in Table 3.1. The apparent increase from the 1950s to the 1960s in the number and percentage of deaths to outdoor recreationists is perhaps due to the increasing number of outdoor recreationists. Table 3.2 gives more detailed data on death and injury to outdoor recreationists, while Table 3.3 breaks down the "Open Water" category of Table 3.2.

In addition to humans, animals are killed by lightning. In 1968, lightning caused the death of 464 cattle (362 killed directly, the remainder by lightning-caused fires), 13 horses (11 killed directly), 42 hogs, 2 dogs, and 1 white ox resident in a museum pasture (Ref. 3.4).

From the foregoing it is obvious what you should not do when out-of-doors during a thunderstorm: do not make a light-

Table 3.1: Deaths and injuries from lightning in the contiguous United States during 1950–1969 (Ref. 3.4)

(1)	All People										Farmers and Ranchers						Outdoor Recreationists						Unknown						Other Known							
	(2)†		(3)‡		(4)		(5)		(6)		(7)		(8)		(9)		(10)		(11)		(12)		(13)		(14)		(15)		(16)		(17)		(18)		(19)	
	Killed	Injured	Killed	Injured	Killed	Injured	Killed	Injured	Killed	Injured	Killed	Injured	Killed	Injured	Killed	Injured	Killed	Injured	Killed	Injured	Killed	Injured	Killed	Injured	Killed	Injured	Killed	Injured	Killed	Injured	Killed	Injured	Killed	Injured		
1950	59	70	10	15	16.9	19.2	12	12	11	20.3	14.1	20	17	49.2	21.8	8	34	13.6	44.8																	
1951	95	109	9	17	9.5	15.6	28	12	29.5	11.0	41	33	43.2	30.3	17	47	17.9	43.1																		
1952	88	94	7	13	8.0	13.8	27	16	30.7	17.0	30	42	34.1	44.7	24	23	27.3	24.5																		
1953	71	98	8	13	11.3	13.3	9	4	12.7	4.8	44	56	62.0	57.2	10	25	14.1	25.5																		
1954	113	203	28	39	24.8	19.2	26	32	23.0	15.8	50	82	44.3	40.4	9	50	8.0	24.6																		
1955	113	206	11	15	9.7	7.3	38	56	33.6	27.3	51	93	45.2	45.2	13	42	11.5	20.4																		
1956	104	237	19	58	18.3	24.4	40	50	38.5	21.1	33	65	31.7	27.4	12	64	11.5	27.0																		
1957	112	277	23	38	20.5	13.7	29	40	25.9	14.4	43	67	38.4	24.2	17	132	15.2	47.7																		
1958	73	243	23	53	31.5	21.8	15	48	20.6	19.8	26	77	35.6	31.7	9	65	12.3	26.8																		
1959	153	326	39	56	25.4	17.2	38	51	24.8	15.6	47	125	30.7	38.4	29	94	18.9	28.8																		
1960	100	199	21	44	21.0	22.1	28	27	28.0	13.6	32	70	32.0	35.2	19	58	19.0	29.1																		
1961	115	254	24	33	20.9	13.0	34	38	29.6	15.0	40	92	34.8	36.2	17	91	14.8	35.8																		
1962	122	243	36	65	29.5	26.7	37	38	30.3	15.6	29	80	23.8	32.9	20	60	16.4	24.7																		
1963	136	209	35	44	25.8	21.0	42	68	30.9	32.6	40	59	29.4	28.2	19	38	14.0	18.2																		
1964	108	241	22	42	20.4	17.4	35	47	32.4	19.5	20	79	18.5	32.7	31	73	28.7	30.3																		
1965	126	231	39	60	31.0	26.0	38	42	30.2	18.2	33	54	26.2	23.4	16	75	12.7	32.5																		
1966	88	188	32	76	36.4	40.4	21	27	23.8	14.4	13	64	14.8	34.0	22	21	25.0	11.2																		
1967	73	157	31	53	42.4	33.7	17	24	23.3	15.3	7	34	9.6	21.6	18	46	24.7	29.3																		
1968	108	363	42	149	38.9	41.1	38	36	35.2	9.9	11	48	10.2	13.2	17	130	15.7	35.8																		
1969	97	200	35	58	36.1	29.0	35	47	36.1	23.5	9	31	9.3	15.5	18	64	18.6	32.0																		
	2054	4156	494	941			587	714			628	1268			345	1233																				

* Totals in 1963 do not include 81 fatalities in an airliner crash apparently caused by lightning (Chapter 4).

† Column 2 equals the sum of Columns 4, 8, 12 and 16. Column 5 equals the sum of Columns 5, 9, 13 and 17.

ning rod of yourself and do not stand beneath a lightning rod. Avoid projecting above the surrounding landscape, as you would do if you were standing in an open field, on the beach, or fishing from a small boat. Avoid standing under isolated trees or under any other isolated shelters. (Potentially dangerous sun and rain shelters are often provided on golf courses.) Stay away from wire fences, overground pipes, rails, and other metallic paths along the ground which could carry lightning currents to you from a stroke which has hit some distance away. Avoid swimming, since the current from a nearby stroke to the water can flow through the water to you.

Here's what you should do if caught out-of-doors during a thunderstorm. In an urban area, seek shelter in a building (preferably with metal frame and/or with a lightning rod system) or in a car (not a convertible) with the windows rolled up (see Chapter 4). In the wide-open spaces, find a ravine, valley, or, as a last resort, a depression in the ground. Crouch or lie down. In a wooded area, seek shelter in dense woods or among a thick growth of small trees.

Relatively few people are killed indoors by lightning. The greatest number of indoor deaths is probably due to lightning-caused fires. Nevertheless, between 1959 and 1965 four people were reported killed by lightning while using their telephones (Ref. 3.1); many others were killed because they were near, or in contact with, fixtures connected to the house plumbing or to appliances that were plugged into the house wiring system.

When lightning strikes a house without a lightning rod system, the lightning current generally follows the water pipes and electrical wiring in an attempt to get to ground. It may also enter a house on the telephone or electric wires or on the lead-in wires from an exterior TV antenna. (The mast to which an external TV antenna is attached, and from which it is electrically isolated, should be well connected to ground in accord with the codes for lightning rod systems.) If the particular conductor in which the current is traveling is not well-connected to ground, the lightning may choose to leave that conductor and jump through the air to what it regards as a better path to ground. The trip through the air, or side flash, accounts for a

Table 3.2: Known lightning deaths and injuries among outdoor recreationists in the 48 contiguous United States during 1950–1969 (Ref. 3.4)

Activity at time of strike	Killed	Injured
In, on, or near open water	200	177
Golfing	95	164
Camping or picnicking	36	188
Viewing or participating in athletics	29	65
Hiking or climbing	19	45
In, on, or near land vehicle	7	8
Horseback riding (pleasure)	9	8
Other recreation*	65	190
Unknown recreation**	34	96
Total	494	941

* Includes sightseers, recreation strollers, youths at play (except athletics) anywhere outdoors, and others.
 ** Persons identified by data source as having been at recreation areas at time they were struck, with no specific activity indicated.

Table 3.3: Analysis of “In, on, or near open water” in Table 3.2 (Ref. 3.4)

Sub-Category	Killed	Injured
Fishing from shore, bank	39	30
Fishing from boat	33	21
Other boat	30	38
Swimming	9	9
Other and unknown water*	89	79
Total	200	177

* Mostly persons on lake or ocean shores or stream banks and persons whose activities were listed in the data sources only as “fishing” with no indication as to whether they were on shore or in a boat.

significant fraction of indoor lightning fatalities (as well as being one of the ways in which people standing beneath lightning struck trees can be killed). Thus during a thunderstorm it makes good sense to stay far away from bath tubs, sinks, plugged-

in appliances, telephones, or any objects that have a metallic connection with the outside.

Telephone and electric companies attempt to design systems which discourage lightning from entering houses via their wires. A "lightning protector" (costing about \$50, excluding installation) on the main circuit breaker or fuse box will short-circuit to ground lightning current attempting to enter a house on the electric wires. A similar "lightning protector" is sold for TV lead-in wires. Protection of your house against direct lightning strikes can be accomplished with a lightning rod system (Chapter 2) at a cost of several hundred dollars (including installation). If lightning does enter electrical wiring, it can cause considerable damage to plugged-in appliances. Although it is safest to unplug all appliances before a thunderstorm, this is somewhat impractical. For a typical urban house in a region of moderate thunderstorm activity, say Pennsylvania or New York (see Chapter 7), the frequency of strikes to the house is statistically about once every hundred years (see Chapters 6 and 7). Saying the same thing another way, one in every hundred houses is hit each year.

Lightning "deaths" are often reversible. Many victims who appear dead, in that they are not breathing and have no heart beat, can be revived with proper first aid (Ref. 3.5). It is tragic that this fact is not more widely known. If a victim is still breathing, he will, in all probability, recover.

Often, when a person is involved in a lightning accident, heart action and breathing stop instantly. There is medical evidence that all metabolism seems to stop (Ref. 3.5). Typically the heart starts again, but respiration does not. If the victim does not breathe for a prolonged period, he suffers brain damage from lack of oxygen. The apparent stopping or slowing of metabolism can seemingly lengthen the usual five or six-minute period before appreciable brain damage occurs. A case was reported in which the victim apparently did not breathe for between 13 and 22 minutes, and still made an essentially complete recovery (Ref. 3.6).

If the victim's heart has started spontaneously but his breathing has not, his airway should first be cleared and then mouth-

to-mouth artificial respiration given at about one breath every 5 seconds. If his heart is not beating (if the victim has no pulse), both heart action and breathing must be restarted. Heart action can be stimulated by placing the victim on his back and pressing firmly on his chest (on the lower half of the sternum above the point where the ribs come together) with the heel of the hand once every second or slightly faster. A person alone with the victim should alternate between 15 chest compressions and 2 mouth-to-mouth respiration cycles. If two rescuers are present, one should compress the chest at a steady rate of once per second while the other gives one breath every five compressions timed so that the breath is going in as the hands are coming up. This first aid should be continued until the victim's heart action and breathing begin or until professional medical help is secured. The above is only a brief explanation of the rudiments of cardio-pulmonary resuscitation (CPR) and is no substitute for a proper education in these life saving procedures (Ref. 3.7).

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THE EVENT

PETRIFIED LIGHTNING FROM CENTRAL FLORIDA

A PROJECT BY ALLAN MCCOLLUM

CONTEMPORARY ART MUSEUM
UNIVERSITY OF SOUTH FLORIDA

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TAMPA, FLORIDA