

Lightning

Lightning is the result of the discharge of electrical energy between positively and negatively charged areas. Lightning generates intense heat (approximately 50,000° F). The rapid heating and cooling of the air produce a shock wave, which produces the characteristic thunderclap.

Most lightning occurs within and between clouds. From a distance and at night this appears as the characteristic “heat lightning,” typically not associated with a storm. Heat lightning, however, is the same as any other lightning. It is just too far away for the thunder to be heard. It may indicate an approaching storm.

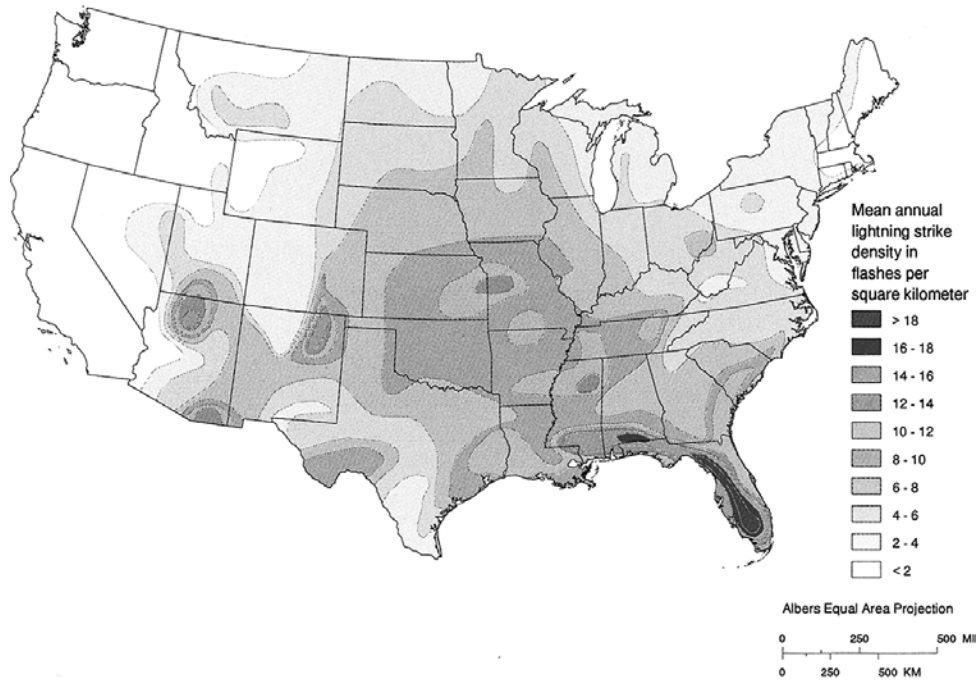
Cloud-to-ground lightning starts as an invisible discharge of energy from a cloud toward the ground. As it approaches the ground, a surge of energy from the ground moves up. This sometimes can be observed as a narrow upward-moving streak from a tree or building. During this surge people in the proximity will notice their hair stand on end and may hear a crackling noise in the air. This is the time to roll into a ball on the ground to reduce surface area and the potential for being struck by lightning. Rubber shoe soles do not prevent the conduction of lightning through a person to the ground. The upward surge of energy is followed by the visible lightning bolt from the cloud to the ground. Lightning is most likely to strike hilltops, objects on or near water, and freestanding trees and buildings.

All thunderstorms are dangerous, even at a distance. This is because lightning can strike up to 10 miles from a storm and frequently strikes within 2 miles, even in the absence of rain. As a general rule, if thunder can be heard, lightning is within striking distance. Therefore audible thunder should be taken as a sign to take shelter, turn off appliances (e.g., air conditioners), and stop using phones.

Every year lightning starts approximately 15,000 wild fires and over 4000 residential fires. It has been estimated that over 300,000 domestic insurance claims (about 5% of all claims) are filed every year because of damage caused by lightning. However, the real cost of lightning is probably many fold higher than the claims reflect because much of the damage from lightning is less than the deductible for insurance claims settlements. Examples include phone systems and small appliances that owners have to pay out of their own pockets to replace.

In one study conducted for the years 1973 to 1982 nearly 3000 business-related claims were assessed as the result of lightning strikes. The average cost of damages to the businesses was \$13,000, but this expense did not include the cost of idle work force or lost revenues from decreased sales or interactions with clients. Veterinary practices, animal shelters, farms, and other animal-related businesses should take note of these amounts, which clearly indicate that small disasters, such as thunderstorms, can commonly affect them. The greatest cost-benefit mitigation measure against lightning is to install surge protectors for all sensitive equipment. This includes phones, computers, and appliances. Lightning conductors on buildings are also recommended, although their usefulness has frequently been questioned.

The most common lightning strike victims are young children and males up to 35 years of age. This age and gender distribution reflects the persons likely to be outside at work or leisure. Similarly livestock and horses are the domestic animals most likely to be struck by lightning because they live outdoors. These are especially vulnerable if they are pastured where there are large freestanding trees. If these trees are not fenced off, the animals will congregate around them in a storm. If lightning then strikes the tree, the electricity frequently is conducted through the animals on its way to the ground. This can be avoided by fencing off large freestanding trees and by providing alternative shade and shelter areas that lie lower and are protected.



Distribution of lightning hazard in the United States by month of occurrence. (From Federal Emergency Management Agency: Multi-hazard identification and risk assessment: a cornerstone of the national mitigation strategy, Washington, DC, 1997, FEMA.)

A lightning strike is always very dangerous. Approximately 20% of human lightning victims die, and 70% of the survivors have long-term effects. The most common effects include memory loss, sleep disorders, and many other symptoms that indicate central and peripheral nervous system damage. Lightning strike is often fatal in cattle, which may be related to their lower electrical conductance than humans.