

## LIGHTNING KILLS – PLAY IT SAFE NOAA'S CONTINUING EFFORTS TO EDUCATE THE PUBLIC ON LIGHTNING AND LIGHTNING SAFETY

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### 1. INTRODUCTION

Lightning is one of the greatest storm-related threats in the United States. Over the past 30 years, the U.S. National Oceanic and Atmospheric Administration (NOAA) and U.S. National Weather Service (NWS) have documented about 1900 lightning fatalities in the United States based on statistics through 2006 ([NOAA 2008](#)). These statistics show that lightning ranks second in terms of storm-related fatalities with only flooding causing more storm-related deaths in the United States.

To reduce the number of lightning casualties (deaths and injuries) in this country, NOAA and the NWS have worked to find ways to draw attention to this underrated killer. In 2001, NOAA and the NWS teamed up with non-governmental organizations and individuals to draw attention to the dangers associated with lightning. Since then, NOAA's "Lightning Safety Awareness Team" has worked to provide lightning safety information to local NWS offices, the media, emergency managers, teachers, and the public. The centerpiece of this effort is [NOAA's Lightning Safety Web Site](#), which serves as a source of lightning safety information for these groups. Also, NOAA's Lightning Safety Awareness Team and the NWS have designated the last full week in June as Lightning Safety Awareness Week. During this week, NOAA and the NWS work with the media and other organizations to highlight the dangers of lightning.

### 2. NOAA'S LIGHTNING SAFETY CAMPAIGN – A TEAM EFFORT

While NOAA has promoted weather safety and preparedness for many years, the current effort to highlight lightning safety began in 2001 when NOAA organized a team of individuals to spearhead a national lightning safety effort. This "inner core" included people from NOAA and the NWS, as well as non-governmental organizations and individuals, with a knowledge or interest in promoting lightning safety awareness. The overall goal of the effort was to reduce the number of lightning casualties in this country. To accomplish this goal, the inner core initially worked to develop and assemble an array of lightning safety information and materials that could be used as a resource by others.

While the inner core of the team is tasked with assembling information, a critical part of NOAA's lightning safety effort involves people who utilize this information to provide lightning safety information to the public. Included in this "outer core" are the many meteorologists who work at the 123 NWS field offices. These individuals are critical to the success of the campaign because they have the most direct contact with the many local media outlets (large and small) throughout the country. They can also determine the local threat, tailor the information for their particular part of the country, and work with local media outlets to get the information out to the public. Also, local NWS offices are able to issue forecasts or statements at any time to highlight

an imminent lightning threat, and can broadcast this information to the public over the [NOAA Weather Radio](#).

NOAA's partners also play a vital role in getting our safety messages out to the public. These partners include the broadcast and print media, emergency management officials, national and local recreational organizations, and other interested individuals. NOAA's Public Affairs Office and local National Weather Service offices across the country work with national and local media to provide interviews and information for news stories. In addition, various governmental agencies and recreational organizations have worked with NOAA to help get this safety information out to the public.

### 3. LIGHTNING SAFETY AWARENESS WEEK

One part of the lightning safety campaign has been the designation of a nationwide [Lightning Safety Awareness Week](#). The week serves as an impetus for the media to run lightning safety awareness stories in both the broadcast and print media. Although the timing of the week initially varied between April and June, the team permanently set Lightning Safety Awareness Week as the last full week in June for two reasons. First, the week immediately precedes July which is the most active month for lightning in the United States and also the most deadly month in terms of lightning fatalities. Second, during June, there is sufficient lightning activity across the United States (and unfortunately, lightning casualties) to cause the media to carry stories related to lightning safety. Because the media plays a critical role in getting information to the public, their participation in this effort is vital to the success of the campaign.

During Lightning Safety Awareness Week, NOAA focuses on various aspects of lightning or lightning safety. Information is provided in various forms, as described in the sections below, and made available to the media and to the public through NOAA's lightning safety web site. Also, during the week, many NWS offices issue public information statements on lightning safety and work with local media outlets to provide interviews and/or lightning safety information.

### 4. NOAA'S LIGHTNING SAFETY WEB SITE

The centerpiece of NOAA's lightning safety awareness effort is NOAA's lightning web site : <http://www.lightningsafety.noaa.gov> (Figure 1). The web site serves as a clearinghouse for information on lightning and lightning safety. While some basic information is provided on the science of lightning, the main purpose of the web site is to present information on lightning safety issues.

The main web page lists several different topics in the navigation menu on the left-hand side of the page which provide an outline of the information available on the site.

#### 4.1 Overview and Daily Themes

A section of the web site is devoted to each of the daily themes that were selected for Lightning Safety Awareness Week. These include an [overview of lightning and lightning safety](#), a [basic scientific explanation of the causes of lightning](#), [outdoor lightning safety](#), [indoor lightning safety](#), and the [medical effects of lightning on its victims](#).

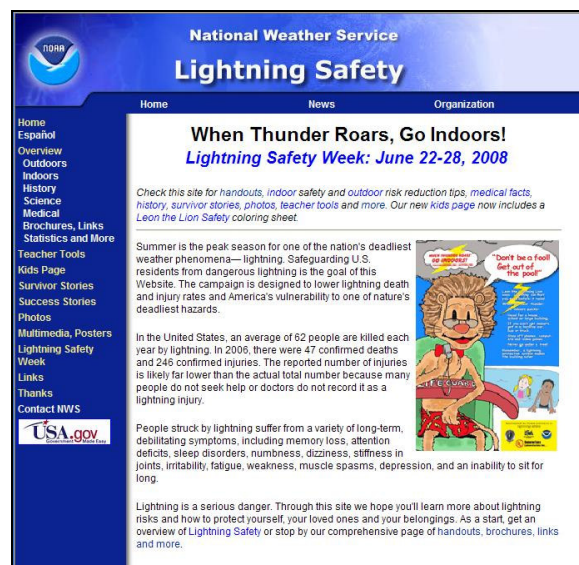


Figure 1. [NOAA's lightning safety web site](#).

In addition to the text available on the lightning safety web site, narrated and annotated presentation files are also available.

#### 4.2 Teacher Tools

A section of the NOAA web site provides information, tools, and reference materials for teachers. Included in this section are a variety of lightning safety presentations for different grade levels. In addition to the general purpose presentations, the site contains information and presentations on lightning safety while at school.

The “Teacher Tools” portion of the web site also provides instructional materials for use in the classroom. These include curriculum guides, coloring books, games, and puzzles.

Figures 2 and 3 show still images from one of several educational presentations on lightning and lightning safety. The presentation from which these images were taken gives a scientific explanation of what causes lightning and includes numerous animated slides. This presentation will become available on the NOAA lightning safety web site during the spring of 2008.

In addition to the educational materials on the science of lightning, information is also included on the dangers associated with lightning and the mechanisms by which people are struck by lightning. Figures 4 and 5 show still images

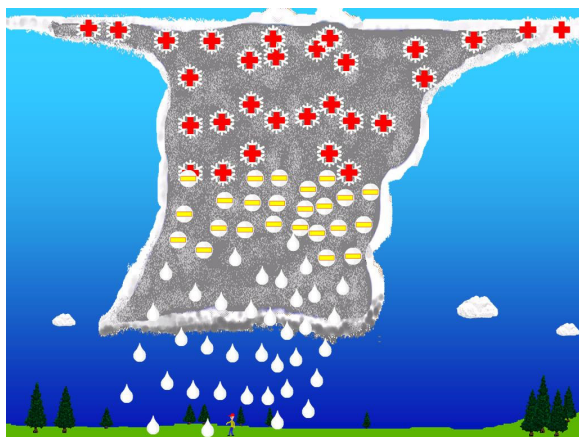


Figure 2. Example of a slide showing charge buildup in cloud.



Figure 3. Same as Figure 2 except slide shows stepped leader process.



Figure 4. Example of a “side flash” from lightning striking a nearby tree.

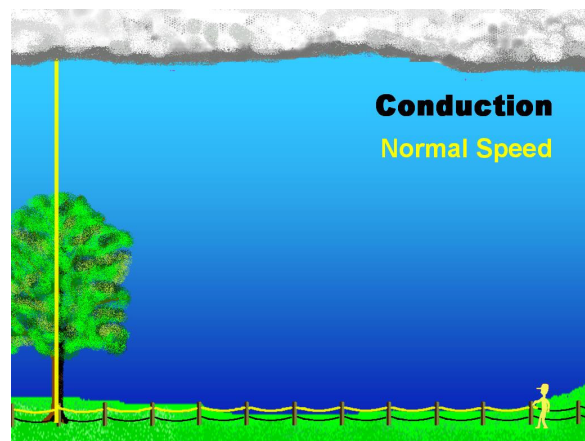


Figure 5. Same as Fig. 4, except lightning conducted through a wire to a nearby person.

from two animated slides which show two of the ways people are struck by lightning. As in Figures 2 and 3, the presentation containing these slides will become available during the spring of 2008.

#### **4.3 Kids Page**

In 2007, a “Kids Page,” designed to educate children on the dangers of lightning, was added to the web site. This section includes links to interactive games, puzzles, coloring books, and a variety of activities. Also during 2007, NOAA enlisted the help of Leon the Lightning Safety Lion (Figure 6), to help deliver safety information to the younger children. Hodanish, et al., 2008, provides a more thorough discussion of the materials developed by NOAA’s Lightning Safety Team for children.

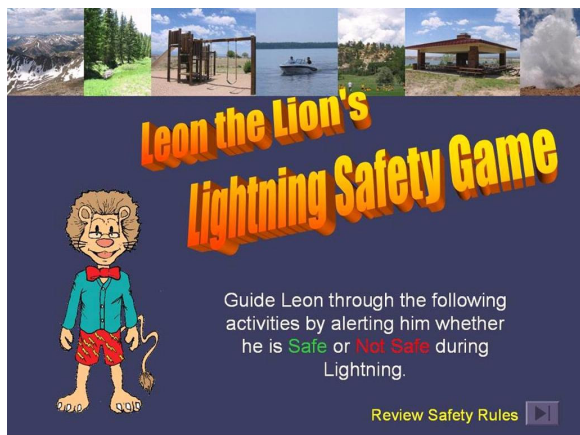


Figure 6. NOAA’s Leon the Lightning Safety Lion Game which challenges children to decide whether certain situations are safe or unsafe from lightning.

#### **4.4 Survivor Stories**

A part of NOAA’s lightning safety web site provides stories from victims who have survived being struck by lightning. This section provides insight into just how devastating a single lightning strike can be on both the victim and his or her family.

While the web site contains stories from only a small sample of lightning victims, many other

victims have worked with NWS offices or the media to tell their stories. At the national level, NOAA has worked with several victims or their families who were willing and able to speak to the national media about their unfortunate incidents. In addition, NOAA works with two organizations established by lightning strike survivors. These include the [Lightning Strike and Electrical Shock Survivors, International \(LSESSI\)](#) and the [Struck-By-Lightning](#) organizations.

#### **4.5 More Information**

The NOAA web site provides a variety of links to access additional lightning safety information or related organizations. These are contained in the section labeled “[Statistics and More](#)” This section links to general and specialized lightning safety recommendations, statistical information on lightning casualties, medical information, policy statements, and more detailed information on the science of lightning.

### **5. PRINTED MATERIALS**

As part of NOAA’s efforts to promote lightning safety awareness, NOAA has developed, printed, and distributed a variety of lightning safety materials. These include articles, papers, posters, pamphlets, stickers, refrigerator magnets, etc. Some of these materials were designed specifically to target certain “at risk” activities (such as water activities) or groups (e.g., golfers). These materials have been distributed by NWS field offices, and electronic versions of these materials are available on the NOAA web site.

Figure 7 shows four of NOAA’s lightning safety posters designed to target people involved in outdoor sports and recreational activities. These, along with other posters, are available for download via [NOAA’s Lightning Safety Multimedia Page](#). The posters feature sports activities such as golf, soccer, and baseball, as well as recreational activities such as hiking, camping, and water-related activities such as swimming and boating. A limited supply of these posters was provided to local NWS offices between 2001 and 2005 for distribution to target groups or organizations in their area.



Figure 7. Four of NOAA's lightning safety posters

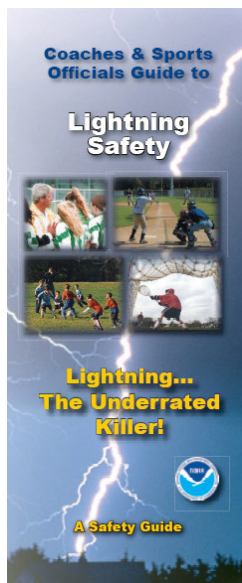


Figure 8 [NOAA's Coaches and Sports Officials Guide to Lightning Safety](#)

In addition to the sports posters, NOAA developed a [lightning safety brochure specifically designed for coaches and sports officials](#) (Figure 8.). The brochure includes basic facts on lightning and lightning safety, recommendations for avoiding the lightning threat, tips on what to do if you get caught outside in a thunderstorm, and information on the immediate medical needs of lightning victims.

NOAA and the NWS have also passed out thousands of refrigerator magnets containing lightning safety information (Figure 9).

## 6. NOAA's PARTNERS

While NOAA's lightning safety team and the NWS field offices have worked diligently to get information out to the public, our partners in the media, emergency management, and response organizations play a very important role in

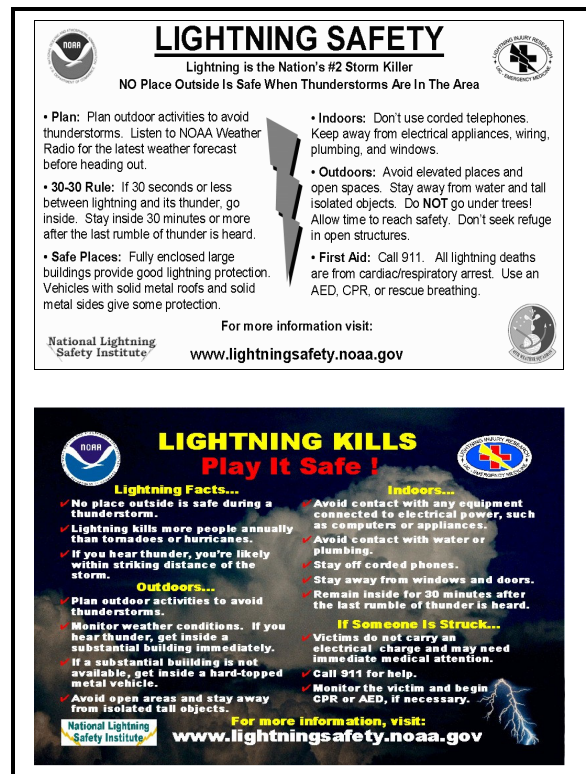


Figure 9. Two of NOAA's lightning safety refrigerator magnet designs.

getting this information distributed. In addition, NOAA's Public Affairs Office has worked with major news outlets to find opportunities to get lightning safety information out to the public.

This has included news stories in the print and broadcast media, interviews for network shows, online chats, and broadcast science shows. In addition, NWS field offices work with their local broadcast and print media to promote lightning safety at the local level.

NOAA's national partners also include emergency management and response organizations such as the Federal Emergency Management Agency (FEMA) and the American Red Cross. The National Aeronautic and Space Administration (NASA) also has an ongoing effort to promote lightning safety.

At the local level, NWS field offices work with state and local emergency management agencies to promote lightning safety. Some state governors have issued gubernatorial proclamations declaring statewide lightning safety awareness campaigns to highlight the dangers of lightning. Also, information has been distributed through state newsletters or state and local emergency management web sites to promote lightning-safe practices.

Several sports organizations also have partnered with NOAA and the NWS on awareness materials. On the lightning safety posters which featured professional athletes, NOAA partnered with the Professional Golf Association Tour, the Women's United Soccer Association, and the Minnesota Twins baseball team. To protect its players, parents, coaches, and spectators, Little League Baseball has also partnered with NOAA to help get lightning safety information distributed.

## 7. PRELIMINARY FINDINGS

NOAA has a 67-year record of lightning fatality data for the United States. In the early 1940's, lightning killed an average of about 375 people each year based on documented cases ([NOAA 2008](#)). By the early 1970's, there were just over 100 documented lightning fatalities each year.

Figure 10 gives the number of documented lightning fatalities for each 5-year period since 1971. As the figure illustrates, documented lightning fatalities have gradually declined over the past 35 years. The 30-year average from 1971-2000 was about 73 documented deaths per year. This compares with an estimated average of about 41 deaths per year for the most recent 5 year period since 2001 when NOAA and the NWS launched the lightning safety awareness campaign.

While it is not possible to determine all the specific reasons for the reduction in lightning fatalities over the past 65 years, the authors believe that at least part of the reduction, especially during the last twelve years, is likely a result of lightning safety education efforts.

<u>Years</u>	<u>Average Number of Fatalities</u>
1971-1975	107
1976-1980	79
1981-1985	72
1986-1990	73
1991-1995	62
1996-2000	47
2001-2005	41
2006-2007*	47

Figure 10. Average number of documented lightning fatalities for 5-year periods since 1971. \*Note that the estimated value for the 2006-2007 period is preliminary and is based on the authors' documentation of the 2006 and 2007 fatalities from print and broadcast media reports of individual lightning incidents.

## 8. CONCLUSIONS

NOAA's efforts to draw attention to the dangers of lightning appear to be working. As a general rule, when it comes to thunderstorms and safety, people balance the risk of being struck by lightning against the inconvenience necessitated by decisions to be safe. However, because many people have only a vague knowledge of the risks associated with lightning, they tend to

underestimate the threat posed by lightning and unknowingly expose themselves to a greater risk than they think. This may be especially true since people often make decisions based on past personal experiences which may include many instances where they engaged in unsafe activities without being struck.

While the ultimate goal of NOAA's efforts is to reduce the number of lightning casualties in this country, an intermediate goal is to educate the public on the dangers of lightning so that they can make more informed decisions when thunderstorms are forecast or are nearby. During the past seven years, the authors have noticed an increase in the number of media stories related to lightning safety, especially during NOAA's Lightning Safety Awareness Week. Also during the last seven years, the number of lightning fatalities in the United States has been relatively low compared to prior years. While it would be difficult to estimate the exact impact of the NOAA's awareness campaign on the number lightning fatalities, it is very likely that NOAA's nationwide campaign, along with the efforts of other individuals and organizations, have contributed to the declining number of lightning fatalities in the United States.

With regard to organized outdoor activities, NOAA and the NWS continue to work with both local and national organizations to emphasize the need for written lightning safety policies and plans. It is important that these policies are well known and publicized before any outdoor event begins so that everyone involved in the activity is aware of and ready to follow the policies and act upon the plans.

Continued efforts to inform and educate the public are needed to keep the number of lightning casualties low. Personal experience and a lack of knowledge often give people a false sense of safety. This false sense of safety, combined with the desire not to be

inconvenienced, can lead people to engage in unsafe activities when thunderstorms are nearby. Education is the most powerful tool we have for decreasing lightning casualties. People who understand the dangers of lightning and know what actions to take when lightning threatens will make better decisions for themselves and those around them. Without continued lightning awareness efforts, lightning casualties would likely increase.

## 9. ACKNOWLEDGEMENTS

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## 10. REFERENCES

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