



## United States Lifesaving Association

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### Guideline: Lightning Safety

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### Introduction

NOTE: This material is a joint product of the USLA and the National Weather Service.

Every year, lightning strikes and kills people on or near bodies of water. Summer is the peak season for outdoor and water-related activities, and when most lightning deaths and injuries occur. As recently as 2011, a lifeguard was fatally struck by lightning in Florida. Lightning cannot be prevented, but the vulnerability of lifeguards, beach-goers, and patrons near bodies of water can be minimized. Vulnerable locations include: beaches, outdoor pools, diving boards, lifeguard stands, and nearby outdoor recreational facilities. While every state has reported lightning-related fatalities, the highest numbers are reported in states bordering the Great Lakes, southern states bordering the Atlantic Ocean and Gulf of Mexico, and the four corners states of Colorado, New Mexico, Utah, and Arizona. This document serves as a guideline for developing a lightning safety plan and communicating lightning safety information. These guidelines are aimed primarily at areas of the country with moderate to high lightning hazard levels, but may be applied anywhere.

### Guidelines

1. Develop an Emergency Action Plan (See attached model plan and edit to your location)
  - 1.1. Have a means to garner daily weather forecasts and updates.
  - 1.2. Identify means to monitor lightning in the area.

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- 1.3. Identify the closest safe locations before the beginning of the season, and consider posting signs that promote lightning safety and indicate locations that provide protection from lightning.
- 1.4. Locations that offer protection from lightning:
  - 1.4.1. Fully-enclosed buildings that are grounded with wiring and plumbing
  - 1.4.2. Lifeguard towers that are fully-enclosed and compliant with NFPA 7801 lightning guidelines
  - 1.4.3. Fully-enclosed metal vehicles (no soft top convertibles)
- 1.5. Locations that do not offer protection from lightning:
  - 1.5.1. Beaches
  - 1.5.2. Water
  - 1.5.3. Open-sided pavilions (such as picnic areas)
  - 1.5.4. Restrooms, changing facilities, and showers
  - 1.5.5. Lifeguard stands that are not fully enclosed and compliant with NFPA 7801 lightning guidelines
  - 1.5.6. Tents
  - 1.5.7. Boats that are not designed or retrofitted to be compliant with NFPA 7801 lightning guidelines
  - 1.5.8. Small personal water craft (e.g. Jet Skis)
- 1.6. Determine what actions to take based on the threat level, including:
  - 1.6.1. How patrons will be notified
  - 1.6.2. Whether to evacuate facilities or just issue warnings and advice on safe shelter
  - 1.6.3. How staff will protect themselves
  - 1.6.4. When to notify staff and patrons that the threat has subsided and normal activities can resume
2. Educate Staff
  - 2.1. Annual training for lifeguard and beach patrol units should include lightning awareness and a review of protocols in their hazardous weather safety plan. This includes:
    - 2.1.1. Education on facts about the dangers of lightning
    - 2.1.2. Locations that provide protection
    - 2.1.3. Emergency action plan for lightning in the area, along with severe weather watches and warnings

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<sup>1</sup> National Fire Protection Association (NFPA) 780- Standard for the Installation of Lightning Protection Systems

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- 2.2. Suggest staff members attend the free National Weather Service SkyWarn™ basic storm spotter training to enhance weather awareness. Counties typically have a local spotter training session once every 1 to 2 years; along with an online class for those unable to attend in person. Date, time, and location of classes can be found from navigating from <http://www.weather.gov> to your local National Weather Service office home page.
3. Warning and Communication Tools
  - 3.1. NOAA weather radio.
  - 3.2. Forecasts can be monitored via the internet if available on-site.
  - 3.3. Information about the proximity of lightning strikes is available via the flash-to-bang rule (explained below), local on-site detection devices, smart phone applications and commercial notification services.
  - 3.4. Identify means to communicate with and notify staff and patrons. Communication tools include:
    - 3.4.1. Two-way radios
    - 3.4.2. Public address, loudspeaker system (fixed and/or on mobile vehicles)
    - 3.4.3. Telephones, including mobile phones
    - 3.4.4. Air horn or megaphone notification
    - 3.4.5. Whistle system
    - 3.4.6. Sign boards and flags
    - 3.4.7. Text, e-mail and social media alerts
    - 3.4.8. Internal television and/or radio broadcasts
4. Daily Operations
  - 4.1. Designate a “weather watcher” each day.
    - 4.1.1. At the beginning of the shift, designee notifies staff of weather forecasts that may impact operations that day
    - 4.1.2. Identify safe shelter locations
    - 4.1.3. The weather watcher has primary, but not sole, responsibility for observation of and updates on weather conditions.
  - 4.2. Determine the distance of lightning from a location by using the “flash-to-bang rule”
    - 4.2.1. Begin counting at the sight of the lightning flash. Stop counting at the sound of related thunder. Divide the count by five (5) to determine the proximity in miles of the lightning strike (5 seconds = 1 mile; 50 seconds = 10 miles, etc).
  - 4.3. Use this rule in combination with other resources (local lightning detection systems and commercial services) if they are available, with the closest strike detected or observed used as guidance for the evacuation of a site.
  - 4.4. Lightning most frequently occurs within 10 miles of a thunderstorm (although there are occurrences when cloud-to-ground lightning strikes known as “bolts from the blue” can

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strike up to 20 miles away from a thunderstorm). It is generally recommended that patrons be notified (or evacuated based on the emergency action plan) and staff take shelter when thunderstorms move within 10 miles.

4.4.1. Depending on the attendance levels and the proximity of adequate shelter, a larger radius of lightning may be prudent to provide time to prepare.

4.4.2. Consider the organization of thunderstorms in the area. More organized thunderstorms (squall lines, bow echoes, super cells, large clusters) should prompt a greater lead-time as compared to an isolated thunderstorm.

4.5. When in doubt, remember “When Thunder Roars, Go Indoors!”

5. Lightning Injury Response

5.1. Ensure scene safety (victims do not carry an electrical charge and can be touched)

5.2. Follow local protocols for trauma injury and triage. If necessary, safe, and appropriate, move the victim to a safe place away from the threat of another lightning strike

5.3. Summon an ambulance as needed according to local protocols

5.4. CPR and/or AED may be necessary

5.5. Heart irregularities, shock, or sudden loss of consciousness are possible. Keep the conscious victim calm and monitor closely

**Attachments**

Model Lightning Emergency Action Plan

Lightning Site Preparation Checklist

## **Model Lightning Emergency Action Plan**

NOTE: This plan contains options that should be tailored to local circumstances, available equipment, and predetermined evacuation options. For locations with high attendance or lack of nearby shelter, it may be prudent to initiate actions earlier than suggested.

1. **Weather Watcher**: Designate a person or persons to monitor lightning and severe weather each day
  - 1.1. Weather watcher reviews available forecasts. NWS Advisories, Watches, and Warnings can be monitored at [http://www.weather.gov/\(insert local office identifier\)](http://www.weather.gov/(insert local office identifier)). Thunderstorm and severe weather forecasts are also online at <http://www.spc.noaa.gov>.
    - 1.1.1. A “Watch” indicates that conditions are favorable for severe weather to develop.
    - 1.1.2. A “Warning” means that severe weather has been detected and may be imminent to the locale.
  - 1.2. If the weather watcher has questions about a storm, contact the National Weather Service in *(insert local office)* at *(insert office phone number)*.
  - 1.3. Weather watcher notifies staff of predicted weather hazards
  - 1.4. Staff notifies public of weather forecast (e.g. via information boards, PA announcements, multimedia notification)
  - 1.5. Weather watcher notifies staff when hazardous weather is imminent
  - 1.6. Weather watcher and other staff use available tools to monitor weather
    - 1.6.1. NOAA weather radio
    - 1.6.2. On-site lightning detector *(optional)*
    - 1.6.3. Smartphone application *(optional)*
    - 1.6.4. Commercial notification subscription *(optional)*
    - 1.6.5. Flash-to-bang rule: The observer begins counting once sighting a lightning flash. Counting is stopped at the sound of related thunder. The count is then divided by five (5) to determine the proximity in miles of the lightning strike. (5 seconds = 1 mile; 50 seconds = 10 miles, etc.).
2. **Threat Level 1**: Lightning detected within 20 miles
  - 2.1. Weather watcher notifies management and staff
  - 2.2. If it appears the thunderstorm is moving toward the site, or if a more organized thunderstorm or cluster of thunderstorms (supercells, squall lines, bow echoes) are headed for the site, a 30-minute lead time or more should be considered for protective actions. The weather watcher should attempt to estimate the speed and direction of the storm movement to determine when it will enter a 10 mile radius of the location.

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2.3. Protective actions

2.3.1. Consider closing facilities that do not provide protection from lightning

2.3.2. Notify the public of the lightning threat and recommended actions:

2.3.2.1. Return to shore

2.3.2.2. Prepare to leave and find shelter (identify appropriate shelter). No place outside is safe if lightning is in the vicinity. Partially enclosed vending areas and picnic shelters are not safe. If a substantial building is not available, fully-enclosed motor vehicles provide good shelter as long as occupants do not touch the metal framework during the thunderstorm. If no protection from lightning is available, direct patrons to stay away from the tallest objects (lifeguard stands, light poles, flag poles), metal objects (fences or bleachers), standing pools of water, and open areas.

2.3.3. Consider initiating predetermined evacuation plans

2.3.4. Ensure staff takes action to protect themselves

3. Threat Level 2: Lightning detected within 15 miles

3.1. Weather watcher notifies management and staff

3.2. Protective actions

3.2.1. Consider closing facilities that do not provide protection from lightning

3.2.2. Notify the public of threat and recommended actions:

3.2.2.1. Exit the water

3.2.2.2. Prepare to leave and find shelter (identify appropriate shelter). No place outside is safe if lightning is in the vicinity. Partially enclosed vending areas and picnic shelters are not safe. If a substantial building is not available, fully-enclosed motor vehicles provide good shelter as long as occupants do not touch the metal framework during the thunderstorm. If no protection from lightning is available, direct patrons to stay away from the tallest objects (lifeguard stands, light poles, flag poles), metal objects (fences or bleachers), standing pools of water, and open areas.

3.2.3. Initiate predetermined evacuation plans

3.3. Ensure staff takes action to protect themselves

4. Threat Level 3: Lightning detected within 10 miles

4.1. Weather watcher notifies management and staff

4.2. Protective actions

4.2.1. Close facilities that do not provide protection from lightning

4.2.2. Notify the public of imminent threat and to take recommended action:

4.2.2.1. Exit the water

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4.2.2.2. Leave and find shelter (identify appropriate shelter). No place outside is safe if lightning is in the vicinity. Partially enclosed vending areas and picnic shelters are not safe. If a substantial building is not available, fully-enclosed motor vehicles can provide shelter as long as occupants do not touch the metal framework during the thunderstorm. If no protection from lightning is available, direct patrons to stay away from the tallest objects (lifeguard stands, light poles, flag poles), metal objects (fences or bleachers), standing pools of water, and open areas.

4.2.3. Implement predetermined evacuation plans

4.2.4. Ensure staff takes action to protect themselves

5. Lightning Injury Response

5.1. Ensure scene safety (victims do not carry an electrical charge and can be touched)

5.2. Follow local protocols for trauma injury and triage. If necessary, safe, and appropriate, move the victim to a safe place away from the threat of another lightning strike

5.3. Summon an ambulance as needed according to local protocols

5.4. CPR and/or AED may be necessary

5.5. Heart irregularities, shock, or sudden loss of consciousness are possible. Keep the conscious victim calm and monitor closely

6. All Clear: The weather watcher will continue to monitor the proximity of thunderstorms and utilize local observations to make an informed decision, determining the appropriate time to recommend reopening outdoor facilities. Management may then allow for normal activities to resume after 30 minutes of no detected lightning strikes within a 10 mile radius of the site. Notify the public that outdoor activities can resume.

## **Lightning Site Preparation Checklist**

1. **Safety Plan:** Have plans for when lightning becomes a threat to the site. Set up lightning proximity criteria and resultant safety actions.

<input type="checkbox"/> Emergency Action Plan (EAP) Developed	<input type="checkbox"/>
<input type="checkbox"/> Staff Trained to Implement EAP	<input type="checkbox"/>
<input type="checkbox"/> Designated Weather Watcher	<input type="checkbox"/>
<input type="checkbox"/> Lightning Proximity Actions	<input type="checkbox"/>

2. **Weather Monitoring Tools:** Investigate the installation of a locally run lightning protection system with a display unit on site, a mobile smart phone application, or subscribe to a commercial notification system. In addition, the facility should have a NOAA weather radio on location. Other options below should be considered.

<input type="checkbox"/> NOAA Weather Radio	<input type="checkbox"/>
<input type="checkbox"/> Smart Phone Application	<input type="checkbox"/>
<input type="checkbox"/> Lightning Detection System_____	<input type="checkbox"/>
<input type="checkbox"/> Commercial Data Service_____	<input type="checkbox"/>
<input type="checkbox"/> Pagers (warning reception)	<input type="checkbox"/>
<input type="checkbox"/> Television (Local network or Cable TV)	<input type="checkbox"/>
<input type="checkbox"/> Radio Station (AM/FM) - EAS Reception	<input type="checkbox"/>
<input type="checkbox"/> Internet (subscription for alerts)_____	<input type="checkbox"/>

3. **Communications:** Have written instructions on how to contact local emergency management and the National Weather Service for information relative to the safety of their patrons.

<input type="checkbox"/> National Weather Service Contact	<input type="checkbox"/>
<input type="checkbox"/> Emergency Manager Contact	<input type="checkbox"/>



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4. **Public Notification Tools:** Have several means to notify its patrons if a lightning threat exists. The following are examples that should be considered.

<input type="checkbox"/> Public Address System	<input type="checkbox"/>
<input type="checkbox"/> Outdoor Warning Siren(s)	<input type="checkbox"/>
<input type="checkbox"/> Vehicle Announcement Patrol	<input type="checkbox"/>
<input type="checkbox"/> Video Board Message Display	<input type="checkbox"/>
<input type="checkbox"/> Site TV Override	<input type="checkbox"/>
<input type="checkbox"/> Telephone Tree	<input type="checkbox"/>
<input type="checkbox"/> Multimedia Notification (email and social media)	<input type="checkbox"/>
<input type="checkbox"/> Local Radio Broadcast (dissemination)	<input type="checkbox"/>

5. **Shelter:** Identify areas of safe shelter. This could include signs indicating where shelters are located and substantial structures on the site's property (e.g. enclosed buildings that are grounded with wiring and plumbing that are easily accessible). Consider investigating other lightning protection equipment which could act as another measure to divert strikes to the tallest object and away from people.

<input type="checkbox"/> Lightning Rods Installed in compliance with NFPA 780 guidelines	<input type="checkbox"/>
<input type="checkbox"/> Primary Shelters Designated and Marked	<input type="checkbox"/>
<input type="checkbox"/> Secondary Shelters Designated and Marked	<input type="checkbox"/>
<input type="checkbox"/> Weather Evacuation Signs Posted	<input type="checkbox"/>