

NATIONAL FLOOD INSURANCE PROGRAM

FLOODING & RELATED WEATHER EVENTS



FEMA



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Introduction to the National Flood Insurance Program

Between 1996 and 2022, 99% of counties in the United States experienced a flood.

With weather events increasing in frequency and severity, more communities are experiencing flooding. The National Flood Insurance Program (NFIP) aims to reduce future flood damage by increasing flood risk awareness, providing people with flood insurance and enforcing floodplain management regulations. This includes educating insurance agents, the media, property owners and community residents on weather events that can cause or worsen flooding.

Learn about these various weather scenarios, what specific climates and regions they can impact, how flooding may be involved and what your community needs to know to reduce risk and be prepared.



Flooding Typically Covered by a Flood Insurance Policy

The NFIP offers flood insurance policies to cover buildings and contents in the event of a flood.


The NFIP defines a **flood** as,

1. “A general and temporary condition of partial or complete inundation of two or more acres of normally dry land area or of two or more properties (one of which is your property) from:
 - a. Overflow of inland or tidal waters;
 - b. Unusual and rapid accumulation or runoff of surface waters from any source;
 - c. Mudflow*.
2. Collapse or subsidence of land along the shore of a lake or similar body of water as a result of erosion or undermining caused by waves or currents of water exceeding anticipated cyclical levels that result in a flood as defined above.”

**Mudflow is defined as “A river of liquid and flowing mud on the surface of normally dry land areas, as when earth is carried by a current of water. Other earth movements such as landslide, slope failure or a saturated soil mass moving by liquidity down a slope, are not mudflows.”*

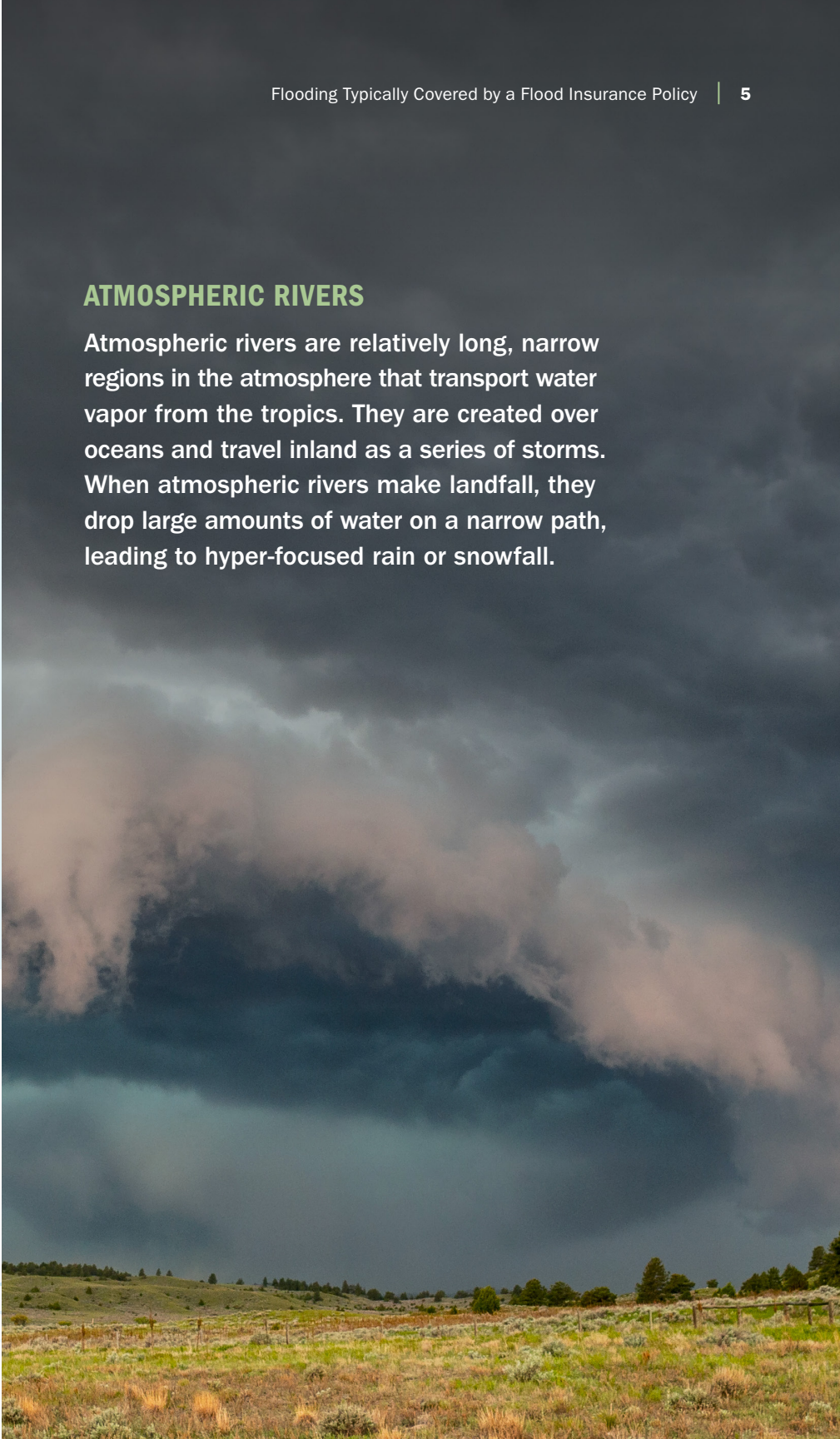
The following weather events or occurrences can cause a flood, as defined by the NFIP’s Standard Flood Insurance Policy (SFIP), which can result in minor-to-catastrophic damage to covered property with little notice.

Coverage by an NFIP flood insurance policy is determined at the time of loss and claims are evaluated on a case-by-case basis, subject to the terms and conditions of the SFIP. For example, there is typically a 30-day waiting period before an NFIP policy becomes effective. The SFIP will not cover flood loss caused by a flood that occurs during the waiting period. Connect with a flood insurance carrier or agent for specific coverage information.



ATMOSPHERIC RIVERS

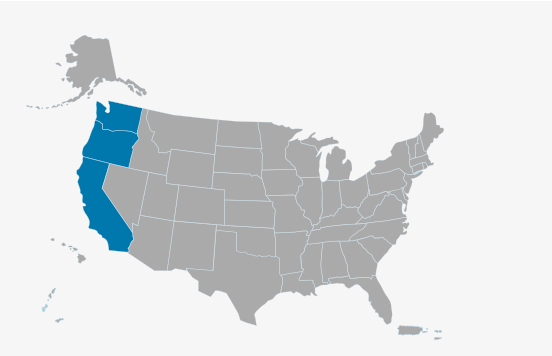
Atmospheric rivers are relatively long, narrow regions in the atmosphere that transport water vapor from the tropics. They are created over oceans and travel inland as a series of storms. When atmospheric rivers make landfall, they drop large amounts of water on a narrow path, leading to hyper-focused rain or snowfall.



ATMOSPHERIC RIVERS

Affected Communities & Regions

Atmospheric rivers are 250–375 miles wide on average. They **predominately affect the West Coast**, causing major flooding and other extreme weather conditions.



Associated Conditions



Mudflow



Mudslides



Rain



Riverine flooding



Snowfall that can lead to flood-inducing snowmelt



Wind-driven rain

Seasonality

Fall, winter and spring, particularly December–February

Did You Know?



Atmospheric rivers can carry **7.5–15 times the water flowing through the mouth of the Mississippi River.**





Costly Flood Damage

Atmospheric rivers cause **more than \$1 billion in flood damage annually**. This number is expected to rise up to \$3.2 billion by the 2090s.

Duration

Typical atmospheric river events last about one day and come in waves. Each wave has its own intensity and is considered an individual incident within a series of storms.

Heavy rain or snowfall can endure for 1–3 days if caught over mountains.

Speed of Development

As atmospheric rivers build, weather teams can identify them 5–7 days before landfall.

Historical Atmospheric Rivers

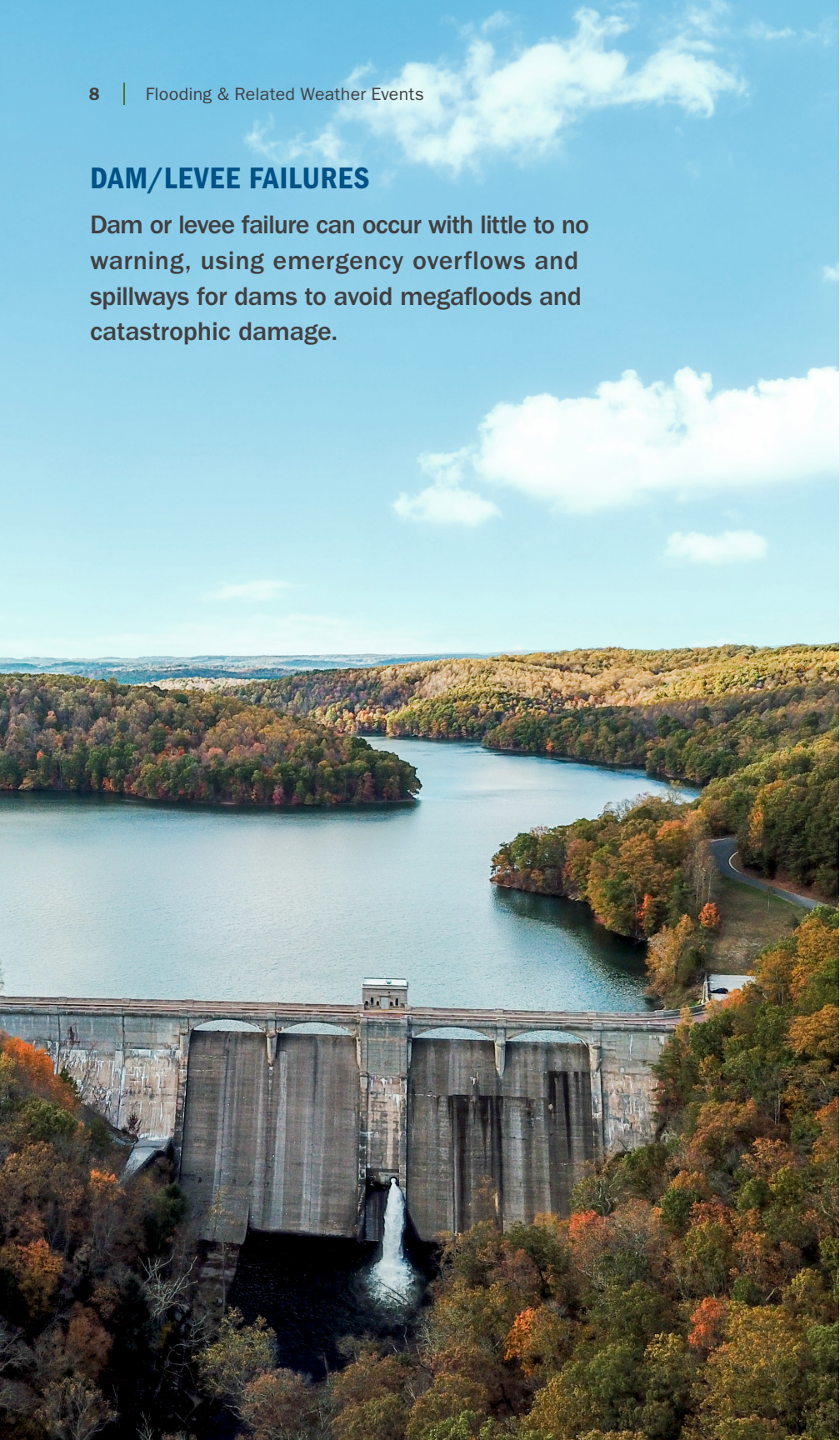
- In 2017, 2019 and 2023, flash flooding was widespread in California due to atmospheric rivers.
- From Dec. 10 to 22, 2010, a series of atmospheric rivers generated strong winter storms that affected communities from Washington to southern California. The National Oceanic and Atmospheric Administration (NOAA) noted that the mountains in the Sierras received 75% of their annual snow before the first official day of winter.

Resources

- *FloodSmart*: It's Atmospheric River Season: Help Your Clients Prepare: agents.floodsmart.gov/its-atmospheric-river-season
- NOAA: What Are Atmospheric Rivers?: noaa.gov/stories/what-are-atmospheric-rivers

DAM/LEVEE FAILURES

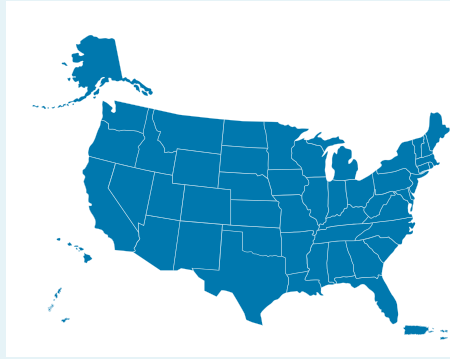
Dam or levee failure can occur with little to no warning, using emergency overflows and spillways for dams to avoid megafloods and catastrophic damage.



Affected Communities & Regions

Dams and levees are located in communities **across the U.S.** People living below dams or near levees are most at risk and should take preparedness actions in case of dam or levee failure.

Emergency action plans are available from local government offices and the U.S. Army Corps of Engineers (USACE), which has emergency plans for all dams or levees under their management.



Historical Dam or Levee Failures

- In February 2017, a section of the Oroville Dam's main concrete spillway was destroyed due to heavy rainfall and erosion. Concerns about the emergency spillway prompted evacuation orders for more than 180,000 people.
- The Teton Dam in Idaho catastrophically failed on June 5, 1976. Though bulldozer operators attempted to fill seepage holes, the dam spewed water at a rate of more than 1 million cubic feet per second. Homes, trees, cattle and cars were swept away by floodwaters in nearby communities of Sugar City, Rexburg and Wilford. The destructive event was the catalyst to create the Bureau of Reclamation Dam Safety Program.



Did You Know?

There are almost **7,000 levee systems** in the U.S., and the average age of a levee is 59 years.

DAM/LEVEE FAILURES

Common Types of Dam or Levee Failures

Overtopping

Occurs when water passes over the top of a dam or levee due to extreme weather events such as heavy rainfall. Areas near dams and levees and those affected by heavy rain are at risk.

Onset & Duration

Overtopping may be sudden with little to no warning, depending on the strength and duration of the severe storm.

Excessive Seepage

Occurs when water seeps through a dam or levee and carries soil away from the structure, causing erosion. Internal erosion may occur in dams with animal burrows, cracks in the structure or trees or shrubs on or near the dam. If untreated, continual water damage and erosion can collapse a portion of the dam. Any area located near dams and levees can be affected.

Onset & Duration

Erosion that causes excessive seepage can happen over time. Seepage can occur slowly or rapidly, depending on the severity of the erosion.

Structural Failure

Occurs when the materials making up a dam or levee (such as concrete or masonry) separate or rupture, or when the embankment of the dam or levee fails, causing structural damage. Any area located near dams or levees can be affected by structural failure.

Onset & Duration

Structural failure happens quickly with no warning. Subsequent flooding may be extensive and last for weeks.





Did You Know?

Today there are **over 91,000 dams in the U.S.** About half of those dams are under 25 feet tall—very few are as large as the Hoover Dam, which was an enormous project.

Associated Conditions



Atmospheric rivers



Spring flooding: snowmelt and ice jams



Rain and other severe weather



Tropical cyclones

Resources

- FEMA: National Dam Safety Program Overview: [fema.gov/dam-safety-overview](https://www.fema.gov/dam-safety-overview)
- FEMA: Living with Levees: [fema.gov/flood-maps/living-levees](https://www.fema.gov/flood-maps/living-levees)
- FEMA: NFIP and Levees: An Overview: [fema.gov/nfip-levees-overview](https://www.fema.gov/nfip-levees-overview)
- USACE: National Inventory of Dams: nid.sec.usace.army.mil
- USACE: National Levee Database: levees.sec.usace.army.mil
- USACE: Dam Safety Program: usace.army.mil/missions/civil-works/dam-safety-program



DEBRIS FLOWS

Debris flows are the movement of sand, rocks, boulders, mud, brush and/or trees by storm water. Floods and mudflows can carry debris, but debris flows exist only when a flood, including mudflow, is the cause.

Affected Communities & Regions

Debris flows occur most commonly on **areas near slopes or slants** (such as hillsides or mountains) and in arroyos or other types of ravines during intense rainfall, particularly where burn scars are present.

Deep Dive



Burn scars are areas where wildfires destroy rainfall- and runoff-absorbing vegetation. They appear immediately after a fire or wildfire and can last for up to five years, especially with recurring fire events. **Rainfall can quickly run off in a burn scar, as burned soil can be as water repellent as concrete.** More information on burn scars can be found on **page 37**.

Onset & Duration

Debris flows typically last between 30 minutes to several hours and can travel for miles. Some debris flows are very fast, reaching up to 100 mph, but most are between 10 and 30 mph.

Resources

- FEMA: Resources to Understand Debris Flows: [fema.gov/case-study/resources-understand-debris-flows](https://www.fema.gov/case-study/resources-understand-debris-flows)

FLASH FLOODING

Flash flooding is the rapid onset of flooding following heavy or excessive rainfall. It can occur within minutes or hours of intense rain and turn into raging torrents.

Prolonged rainfall or heavy, excessive rain in a short period can cause flash flooding if the soil cannot absorb the accumulating water. The intensity and duration of the rainfall influence the severity of the flash flooding.

Affected Communities & Regions

Many variables determine how quickly and where a flash flood will occur, including the intensity, speed, location and distribution of the rainfall; the land use and topography; vegetation types; soil type; and soil water content. **Any area in the U.S. is susceptible to flooding from excessive rainfall.**

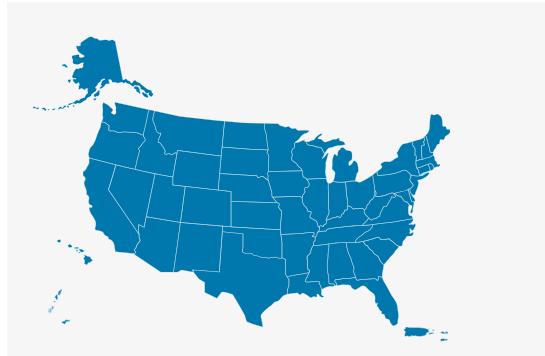
Flash flooding is also possible even if no rain has fallen. Dams and levees failing, debris flows and ice jams can cause the sudden release of rushing water, sending quick-moving flows of water into or through surrounding areas.

Areas at risk for flash flooding include those that are subject to intense rainfall, downstream of dams, behind levees, prone to debris flows or ice jams or have high population densities.



Safety First

Flash floods can occur **anywhere**. **It only takes 6 inches of fast-moving water to knock over an adult and 2 feet of fast-moving water to carry away most vehicles including SUVs and trucks.**



Onset & Duration

Flash flooding can last minutes or hours and may occur with little to no warning.

FLASH FLOODING

Did You Know?



Urban areas are more prone to flash flooding than rural areas due to changes in land use, leading to more impermeable concrete surfaces and increased stormwater runoff.

Associated Conditions



Atmospheric rivers



Warm or cold fronts



Extreme rainfall in a region



Winter storms



Tropical cyclones

Resources

- FEMA: Be Prepared for a Flood: community.fema.gov/how-to-prepare-for-floods
- FEMA: Flash Flooding: Be Ready to Act: fema.gov/fact-sheet/flash-flooding-be-ready-act

Increasing Risk



From 1900 to 2010, **precipitation totals increased by as much as 20% across the Midwest**, and they will likely continue to increase.

KONA LOWS

A kona low or kona storm is a seasonal subtropical cyclone.

Affected Communities & Regions

These storms typically approach **Hawaii** from the northwest and push cooler or colder air across the islands, potentially causing higher-than-normal water levels and coastal flooding along the islands' shores.

Areas where the islands typically do not get much rain are especially vulnerable to floods, landslides and mudslides. These places are drier with less vegetation and shallower soil.

Associated Conditions



Coastal flooding



Flash flooding



Hailstorms



Heavy rainfall



High winds



Landslides



Mudslides

Duration

A kona low can last several days, depending on the storm's strength.

Seasonality

Late fall, winter and spring

Historical Kona Lows

In December 2011, a kona low brought high winds, heavy rain and blizzard conditions to parts of the Hawaiian Islands. Conditions lasted for several days and some areas experienced wind gusts up to 105 mph and waist-deep flooding.



Did You Know?

In the native Hawaiian language, “kona” translates to “leeward.” It refers to the western or south western side of an island which is **usually sheltered from wind and rain, but is subjected to these seasonal subtropical cyclones.**

LAKESHORE FLOODING, SEICHES & METEOTSUNAMIS

Lakeshore flooding occurs when water is driven onto the land surrounding a lake. This flooding impacts the immediate lakefront, bays and the interfaces of lakes and connecting waterways, such as rivers.

Lakeshore flooding can happen when high water levels are combined with strong winds that push water onto the shoreline. It typically occurs during significant storms and can especially affect the Great Lakes region.

Above-average precipitation in the Midwest over the years has increased water levels in the Great Lakes, increasing the potential of severe coastal impacts including shoreline erosion, lakeshore flooding and coastal damage.

Seiches (pronounced “sayshes”) are standing waves with longer periods of water-level oscillations (typically exceeding

periods of three or more hours). They are typically limited to partially or fully enclosed basins, such as Lake Erie.

Meteotsunamis are progressive waves limited to the tsunami frequency band of wave periods (two minutes to two hours). Meteotsunamis can occur in such basins but are also prevalent on the open coast. A single meteotsunami can travel long distances and influence an extensive range of the coastline.

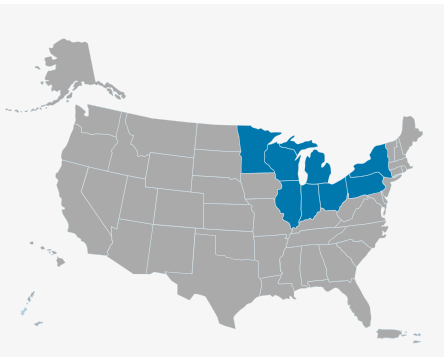
Unlike tsunamis triggered by seismic activity, meteotsunamis are driven by air pressure disturbances often associated with fast-moving weather events, such as severe thunderstorms and squalls.

Affected Regions

The **Great Lakes region** or any area near a large body of water.

Duration

Floodwaters may take days or weeks to recede, depending on the severity of the flooding.



Seasonality

Lakeshore flooding can occur during any season if conditions are favorable.

Speed of Development

Flooding of this type is predictable, and warnings can be issued to provide ample time to prepare.

Historical Lakeshore Flooding

- In 2008, a seiche in Lake Erie caused 12–16 foot waves and flooding in Buffalo, New York.
- In 1844, a 22-foot seiche in Lake Erie breached a 14-foot sea wall. This posed a severe risk to life and so significantly dammed the ice that, for a short period of time, Niagara Falls stopped flowing.



MUDFLOWS

Mudflows are rivers of liquid and flowing mud on surfaces of normally dry land areas. They often come in the wake of wildfires that destroy the vegetation needed to support and strengthen hillsides.

Other earth movements such as landslides, slope failure or a saturated soil mass moving by liquidity down a slope, are not considered mudflows by the NFIP.

Affected Communities & Regions

Mudflows can occur at the **bottom of slopes or canyons or in channels along a stream or river**. They are also common where wildfires or human modification of land have destroyed vegetation and slopes or where surface runoff is detected.

Onset & Duration

Mudflows can develop with little to no warning and travel several miles from their source, causing damage within minutes.

Resources

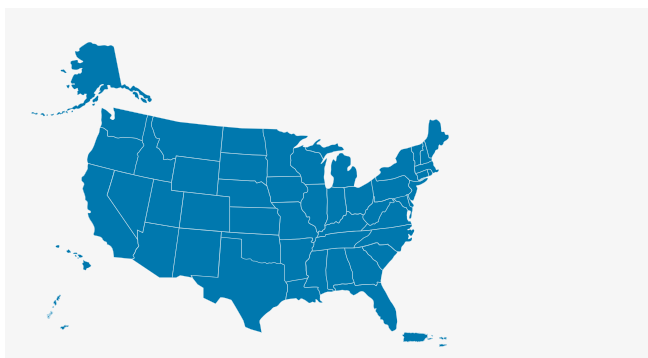
- FEMA: Understanding Mudflow and the NFIP: agents.floodsmart.gov/understanding-mudflow-fact-sheet



RIVERINE FLOODING

Riverine flooding occurs when streams and rivers exceed their capacity to accommodate water flow, causing the water to overflow its banks and spill onto adjacent land.

Riverine flooding may be caused by ice or debris jams. These jams occur when ice or debris impede water flow in a stream or river. This phenomenon blocks the natural flow of water, displacing it onto the surrounding land. Learn more about ice jams on **page 20**.



Affected Communities & Regions

Any areas located near riverbanks can be affected by riverine flooding.

Onset & Duration

Flooding along rivers can happen quickly and may last for days, weeks or longer depending on the severity and elevation of the surrounding floodplains.

Resources

- *FEMA: National Risk Index - Riverine Flooding:*
hazards.fema.gov/nri/riverine-flooding



SPRING FLOODING

SNOWMELT & ICE JAMS

A key source of spring flooding is snowmelt. Unlike rainfall, which reaches the soil almost immediately, snow stores the water until it melts, delaying the arrival of water to the soil for days, weeks or even months.

Once the water from melted snow reaches the soil, it either soaks into the thawed ground or runs off if the ground is still frozen. If more water runs off than soaks in, flooding occurs. Spring flooding can also be caused by an influx of rainfall on saturated soil.

Ice jams can also occur when temperatures warm and ice begins to melt. This can cause ice chunks to become stuck in narrow passages of rivers, building up water and flooding surrounding areas. Ice jams can be worsened due to snowmelt, which results in more water in rivers and lakes.

Associated Conditions



Flash flooding



Sudden temperature swings



Spring rains

Seasonality

Spring (March–June)

Did You Know?



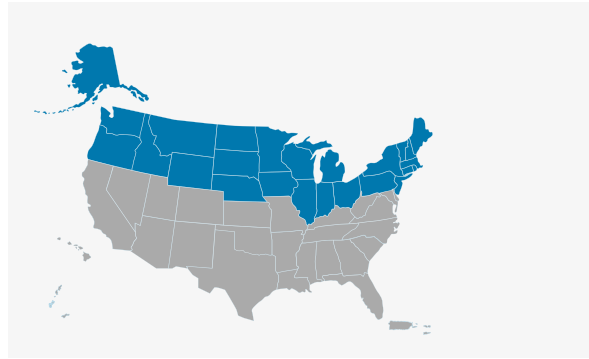
Every year, ice jams cause about **\$125 billion in damage.**

Affected Communities & Regions

Northern U.S. Spring flooding is not limited to low-lying areas. It may also occur in areas around creeks, streams, rivers, lakes and other bodies of water.

Speed of Development

Spring flooding typically develops over days and weeks as snow melts. However, sudden temperature swings can cause snow to melt quickly, increasing the risk of snowmelt runoff and floods. During ice jam flooding, the rates of water level rise can vary drastically, giving nearby areas little notice before flooding begins.



Did You Know?

Snowmelt caused eight of the 20th century's most notable floods (measured by size of area affected, property damage and deaths).

Resources

- *FEMA: FEMA Urges Action Now to Prevent Problems from Spring Flooding:* [fema.gov/spring-flooding-prevention-fact-sheet](https://www.fema.gov/spring-flooding-prevention-fact-sheet)



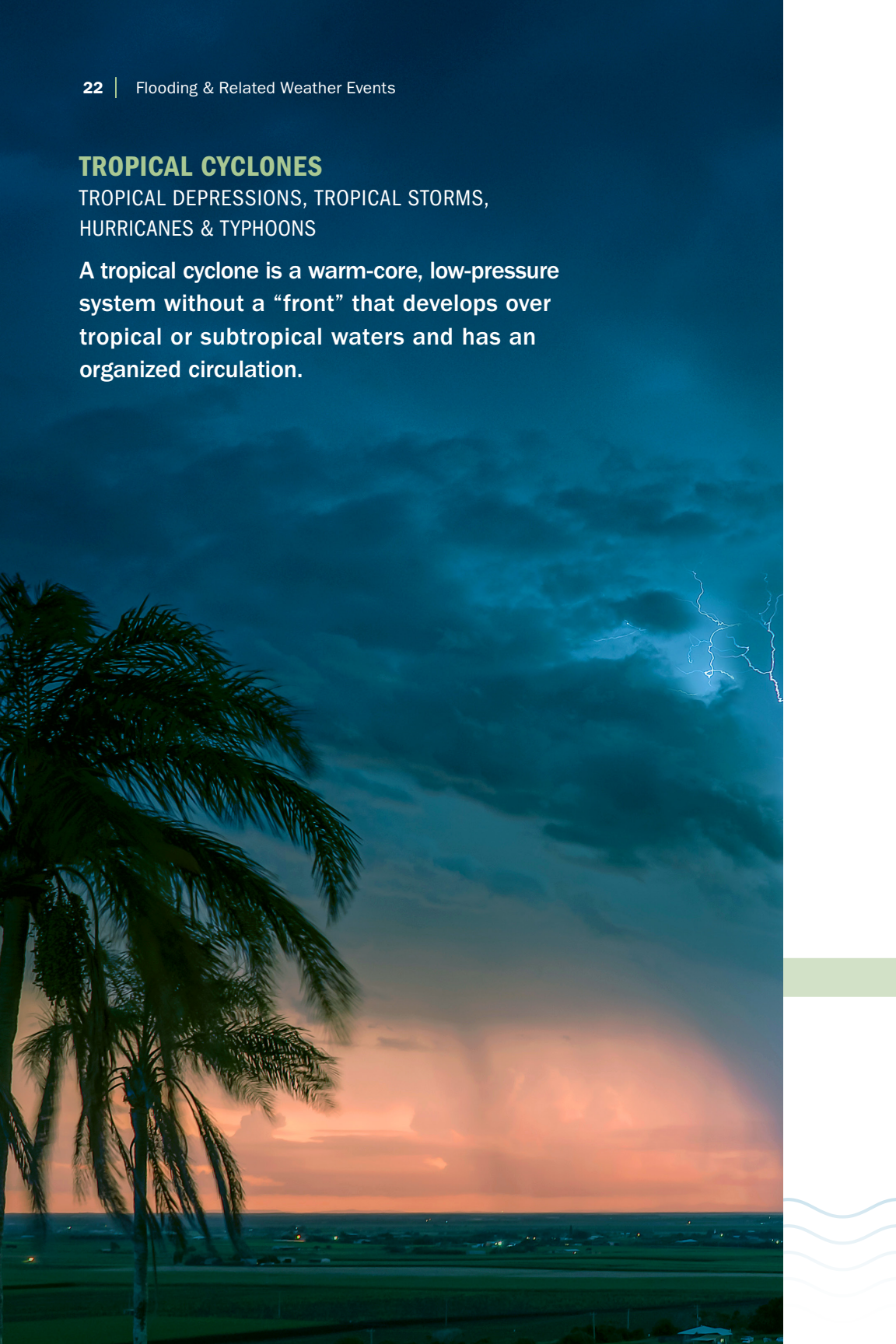
Spring Flooding Outlook

Temperatures are projected to increase throughout the 21st century, which can trigger more rain-on-snow events. **This combination of rain and melting snow can aggravate spring flooding.**

TROPICAL CYCLONES

TROPICAL DEPRESSIONS, TROPICAL STORMS,
HURRICANES & TYPHOONS

A tropical cyclone is a warm-core, low-pressure system without a “front” that develops over tropical or subtropical waters and has an organized circulation.





Did You Know?

Tropical cyclones in the **North Atlantic and central and eastern North Pacific are called hurricanes**. Those that develop in the **Northwest Pacific are called typhoons**.

Tropical cyclones start as weak storms called tropical depressions. If a tropical depression strengthens with maximum sustained winds of 39 mph, it's then classified as a tropical storm.

For a tropical cyclone to be considered a hurricane or typhoon, the storm must have maximum winds of at least 74 mph.

All types of tropical cyclones may cause flash flooding and flood damage. Storm surge flooding to coastal regions and inland flooding is common before a tropical cyclone.

Associated Conditions



Coastal & inland flooding



Storm surge



Flash flooding



Strong winds



Heavy rainfall



Wind-driven rain

Breaking Records

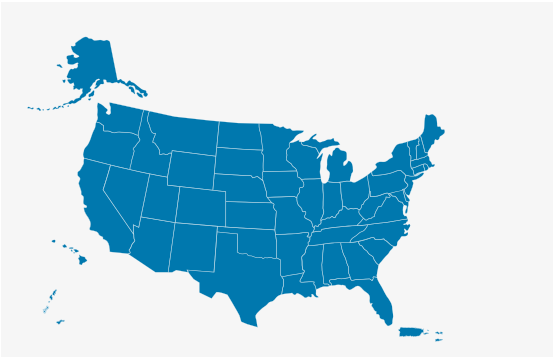


The 2021 Atlantic Hurricane Season was NOAA's third most active year on record. It marked **the first time that two subsequent seasons depleted all 21 storm names**.

TROPICAL CYCLONES

Affected Communities & Regions

Historically, tropical cyclones in the U.S. have impacted **coastal areas**; however, the past decade has proven that hurricanes and typhoons can **impact areas far from the coasts** due to increasing storm strength.



Scale of Measure

Hurricanes are rated on the Saffir-Simpson Hurricane Wind Scale based on their maximum sustained winds.

Category	Damage	Winds
One	Very dangerous winds will produce some damage.	74–95 mph
Two	Extremely dangerous winds will cause extensive damage.	96–110 mph
Three	Devastating damage will occur.	111–129 mph
Four	Catastrophic damage will occur.	130–156 mph
Five	Catastrophic damage will occur.	157 mph+

Duration

Hurricanes and other tropical cyclones can last for two weeks or more over open water, and they run a path across the entire length of the Eastern seaboard.

Seasonality

The Atlantic hurricane season begins on June 1 and ends on Nov. 30; the Eastern Pacific hurricane season starts on May 15 and ends on Nov. 30. However, hurricanes can—and have—occurred outside of these time frames.

Speed of Development

Hurricanes typically last over a week. Over open ocean, they move between 10 and 20 miles per hour.

Historical Tropical Cyclones

On Aug. 29, 2021, Hurricane Ida made landfall near Port Fourchon, Louisiana, as a Category 4 hurricane with sustained winds of 150 mph. It caused life-threatening storm surges, wind damage, heavy rainfall and power outages affecting approximately 1 million homes and businesses along the U.S. Gulf Coast. Unlike past hurricanes, Ida retained strength and caused significant damage in the Northeast.

Resources

- FEMA: How to Prepare for Hurricane Season: [fema.gov/blog/how-prepare-hurricane-season](https://www.fema.gov/blog/how-prepare-hurricane-season)
- FEMA: Tips to Prepare Your Home for Hurricane Season: [fema.gov/fact-sheet/tips-prepare-your-home-hurricane-season](https://www.fema.gov/fact-sheet/tips-prepare-your-home-hurricane-season)



TSUNAMIS

A tsunami is a series of ocean waves caused by earthquakes or volcanic eruptions under the sea. When this occurs, surges of water—sometimes reaching heights of over 100 feet—are sent onto land.

As each successive wave reaches the shore, the tsunami's destructive force may be compounded. After the initial wave front, subsequent flooding events can reach far inland and are typically responsible for most of the tsunami's damage and loss of life.



Once a tsunami is triggered by a sudden disturbance under the sea's surface, the initial set of waves is split into two: one that travels into the deep ocean (a distant tsunami) and another that travels toward a nearby coast (a local tsunami). The height of the tsunami increases as it travels toward the coast, making the first wave of the tsunami steep.

Once on land, part of the tsunami is drawn back into the ocean, while the remaining waves travel back-and-forth near the shore.

Affected Communities & Regions

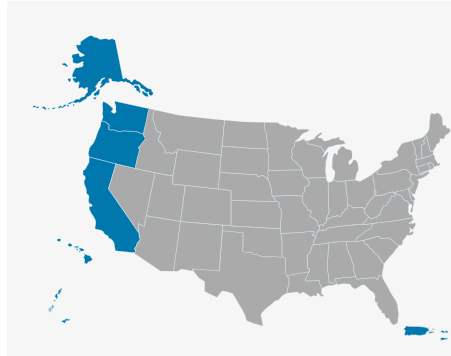
Tsunamis may occur anywhere along U.S. coasts, but **regions that border the Pacific Ocean or Caribbean have the greatest risk**. This includes Hawaii, Alaska, Washington, Oregon, California, American Samoa, Guam, Northern Mariana Islands, Puerto Rico and the U.S. Virgin Islands—with Alaska and Hawaii near some of the most dangerous and active seismic zones.

The greatest threat on the West Coast is from the Cascadia subduction zone, which stretches from northern California to southern Canada. Large Cascadia earthquakes typically happen every 500 years—the last occurred in 1700.



Did You Know?

Since the beginning of the 20th century, tsunamis have caused **more than \$1.9 billion in damage to U.S. coastal states and territories**. Nearly 40% of the U.S. population resides in coastal communities and may be at risk for impacts from a destructive tsunami.



TSUNAMIS

Duration

Tsunamis can have wavelengths ranging from 300 to 500 miles and wave periods of up to two hours. Dangerous flooding and strong currents can follow tsunamis and last for hours or days.

Seasonality

A tsunami can strike any ocean coast at any time—there is no dedicated season.

Associated Conditions



Earthquakes



Landslides



Volcanic eruptions

Speed of Development

Scientists cannot predict when or where a tsunami will occur. However, they can use their knowledge of earthquakes and past tsunamis to deduce which earthquakes may cause tsunamis.

Since tsunamis can quickly develop and hit nearby coasts, warning center scientists use an earthquake's magnitude, location and depth to determine if a tsunami is possible and if they should release an initial tsunami message.

For U.S. coasts, warning center scientists can usually issue initial tsunami messages within five minutes of an earthquake. These messages provide alert levels, information on the earthquake and a threat evaluation.

However, nonseismic tsunamis—typically landslide-generated tsunamis and meteotsunamis—may arrive with little to no warning.

Knowledge Check



About 80% of the world's tsunamis originate around the Pacific Ocean's "Ring of Fire," a geologically active area where tectonic plates meet and shift.



Historical Tsunamis

On Oct. 17, 2015, 180 million tons of rock slid into Taan Fiord (part of Icy Bay in Alaska). This generated a tsunami that destroyed forest across 8 square miles of Wrangell St. Elias National Park and Preserve. The wave reached as high as 633 feet above the inlet. Several factors led to the Taan Fiord tsunami: glacial retreat, ground cracking and creep, a month of elevated rainfall and mere seconds of shaking from a distant earthquake.

Over the last 100 years in Alaska, four giant tsunamis have been caused by subaerial landslides.

Resources

- *FEMA: Understanding Tsunamis and the NFIP:* agents.floodsmart.gov/understanding-tsunamis
- *National Weather Service: U.S. Tsunami Hazard:* nws.weather.gov/nthmp/documents/ushazard.pdf



Weather & Geological Conditions That May Worsen Flooding

Flooding may become more severe when it is preceded or followed by certain weather conditions. Learn more about the following weather events to better understand and anticipate flood risk.

BOMB CYCLONES

A bomb cyclone, also known as bombogenesis, is a mid-latitude cyclone that intensifies quickly over a 24-hour period.



A storm's atmospheric pressure must drop significantly over this period to be considered a bomb cyclone. This drop in pressure mostly occurs when a mass of low-pressure air meets a high-pressure mass. The air flowing from high to low pressure creates the strong winds often associated with bomb cyclones.

Meteorologists identify a bomb cyclone's intensity and forecast potential conditions by measuring how much the storm's atmospheric pressure drops. Weather events associated with bomb cyclones are blizzards, severe thunderstorms and heavy precipitation, but a bomb cyclone can be any type of weather event.



Affected Communities & Regions

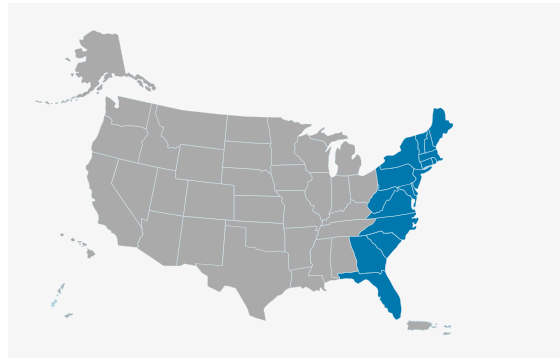
U.S. Eastern Seaboard

Duration

Bomb cyclones occur within a one-day period.

Seasonality

Bomb cyclones are common during the winter months.



Associated Conditions



Flooding



Heavy winds



Heavy rainfall



Severe thunderstorms



Heavy snowfall/blizzards



Wind-driven rain

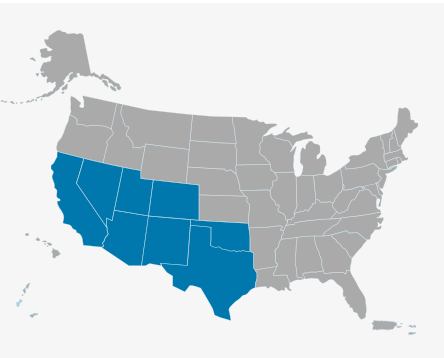
DROUGHTS & HEAT WAVES

Droughts are extended periods without precipitation and often precede heat waves, periods of abnormally hot weather lasting more than two days.



Dry conditions compound with hot weather and can cause soil to harden, making it unable to soak up moisture. When it eventually receives a sudden downpour of rain, it's prone to flooding. During times of heavy precipitation (e.g., monsoon season), floodwaters can rush through dry or small channels and cause flash flooding.

Those seasonal waterways are informally referred to as dry washes, gulches and arroyos. Floodwaters may also rush through slot canyons, which are canyons that were formed over millions of years from water rushing through and eroding the rock (especially sandstone and limestone).



Affected Communities & Regions

The southwestern/western U.S. is primarily affected by heat waves and droughts. However, any area can experience a drought.

Duration

Droughts can last weeks, months or even years and be worsened by an extreme heat wave and/or wind. Today, heat waves generally last four days, up from three days in the 1960s.





Extreme Risk

Extreme heat is the **deadliest weather hazard**.

Scale of Measure

Droughts can be categorized as follows:

Code	Classification	Physical Impacts
D0	Abnormally Dry	Going into drought: the short-term dryness slows planting and crop/pasture growth. Coming out of drought: some lingering water deficits exist and crops/pastures have not fully recovered.
D1	Moderate Drought	Crops/pastures suffer some damage, water shortages are developing or imminent and voluntary water-use restrictions are requested.
D2	Severe Drought	Crop/pasture loss is likely, water shortages are common and water restrictions are imposed.
D3	Extreme Drought	Crops/pastures suffer major losses and there are widespread water shortages or restrictions.
D4	Exceptional Drought	Crop/pasture losses are exceptional and widespread and water shortages in reservoirs, streams and wells cause water emergencies.



DROUGHTS & HEAT WAVES

Increasing Risk



Within the 48 contiguous states, **nine of the 10 hottest years on record have occurred since 1998.**

Associated Conditions



Flash flooding

Seasonality

Summer

Speed of Development

Flash flooding can occur within six hours of a rain event, sometimes even before the rain stops.

Resources

- FEMA: Recovery Resources for Drought: [fema.gov/recovery-resources-drought](https://www.fema.gov/recovery-resources-drought)
- FEMA: Protect Yourself from Extreme Heat: [fema.gov/blog/9-ways-stay-cool-extreme-heat](https://www.fema.gov/blog/9-ways-stay-cool-extreme-heat)



EROSION

Erosion is the process of water breaking down earthen material. It can result in decreased soil fertility, making it less able to hold water and thus worsening flooding or causing the collapse/receding of land.

The water that washes away from the original property, carrying soil and sediment, can also prevent the smooth flow of water at its destination, causing flooding.

Flooding-related erosion is defined by the NFIP as,

- The collapse or subsidence of land along the shore of a lake or other body of water as a result of undermining caused by waves or currents of water exceeding anticipated cyclical levels; or
- The collapse or subsidence of land suddenly caused by an unusually highwater level in a natural body of water, accompanied by a severe storm, or by an unanticipated force of nature, such as a flash flood, an abnormal tidal surge or by some similarly unusual and unforeseeable event which results in flooding.

Affected Communities & Regions

Erosion and its corresponding flood damage can affect **any type of land or property along coasts, rivers and streams**.

Onset & Duration

Erosion can occur during or after a severe storm, flash flooding or abnormal tidal surge and may continue for hours afterward. It may also happen gradually due to waves or currents of water exceeding cyclical levels.

Resources

- *FEMA: Protect Your Property From Coastal Erosion:* [fema.gov/protect-your-property-coastal-erosion](https://www.fema.gov/protect-your-property-coastal-erosion)

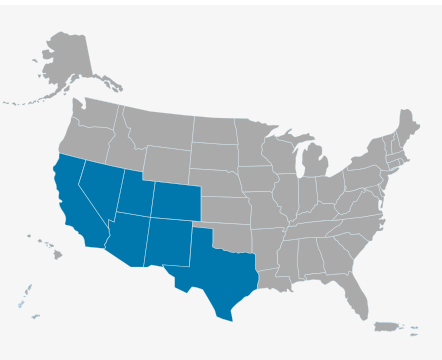
MONSOONS

A monsoon is a seasonal change in the direction of a region's strongest winds.



Monsoons transport moist tropical air to dry desert locations, like the southwestern United States. This moisture is beneficial to the dry desert regions, as much of the area receives 40–50% of its annual precipitation during monsoon season.

Monsoon season may cause or worsen flooding due to the influx of moisture.



Affected Communities & Regions

Monsoons are **most common in Arizona and New Mexico**, but they can also affect western Texas, southern Colorado, Utah, Nevada and southern California.

Seasonality

July–September

Associated Conditions



Debris flow



Flash flooding



Mudflow



Wind-driven rain

Did You Know?



In North America, rainfall from monsoons typically has a diurnal (24-hour) cycle. As opposed to heavy rain lasting months, states might experience **dry mornings while storms develop, then rain in the afternoon and evening.**

Resources

- FEMA: Flood Insurance Protects You All Year Long, Not Only During Monsoon Season: [fema.gov/flood-insurance-monsoon-season-fact-sheet](https://www.fema.gov/flood-insurance-monsoon-season-fact-sheet)



WILDFIRES, FLOOD AFTER FIRE & BURN SCARS

Wildfires are unplanned and spread quickly through natural areas.

Not only can they threaten communities, but they also dramatically alter terrain and ground conditions, leaving land charred, barren and unable to absorb water.

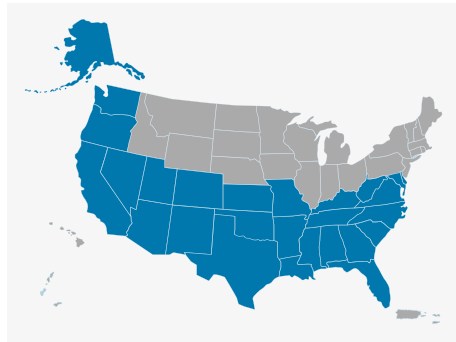
As such, less water is needed to trigger flooding which puts historically flood-averse communities in danger. This increased risk lasts until vegetation is restored, which can take as long as five years from the initial burn.

Affected Communities & Regions

West Coast & Southern U.S.

Onset & Duration

Wildfires can happen rapidly with little warning, with the fire and its effects lasting for weeks to months.



Associated Conditions



Burn scars



Flash flooding



Debris flows



Mudflow

Seasonality

While wildfires and floods after fire are most common during spring and summer, flooding due to burned land can occur any time throughout the year.

Speed of Development

A single spark from lightning or humans can ignite vegetation and travel more than 12 mph.

WILDFIRES, FLOOD AFTER FIRE & BURN SCARS

Scale of Measure

Wildfires are measured by how much area they have burned.

Class	Number of Acres Affected
Class A	One-fourth acre or less
Class B	More than one-fourth acre, but less than 10 acres
Class C	10 acres or more, but less than 100 acres
Class D	100 acres or more, but less than 300 acres
Class E	300 acres or more, but less than 1,000 acres
Class F	1,000 acres or more, but less than 5,000 acres
Class G	5,000 acres or more

Historical Wildfires

- The 2021 Dixie Fire in California was the largest single-source wildfire in state history, burning almost 1 million acres and taking over three months to contain.
- The 2018 Camp Fire in California was the deadliest and costliest wildfire in the state's history. Later that year after the fire was contained, the same area was expected to experience heavy rain and flooding. Burn scarred areas caused the rain to flow elsewhere, triggering mudslides and debris flow.

Resources

- *FEMA: Flood Risk Increases After Fires:* [fema.gov/flood-after-fire-fact-sheet](https://www.fema.gov/flood-after-fire-fact-sheet)
- *FloodSmart: Understanding Mudflow Risk After a Wildfire:* agents.floodsmart.gov/understanding-mudflow-infographic



WINTER STORMS

Winter storms can worsen flooding by dropping snow and other precipitation across the U.S. that eventually turn to snowmelt, part of the water cycle.

Affected Communities & Regions

Winter storms that turn into nor'easters or bomb cyclones throughout the **East Coast** may trigger storm surges that push heavy ocean tides into **coastal communities** on top of already heavy rain or snow. They also bring strong winds that may cause lakeshore flooding along the **Great Lakes region**.

Duration

Winter storms and their associated conditions can last a few hours to several days, depending on the severity of the storm.

Associated Conditions



Ice jams



Lakeshore flooding



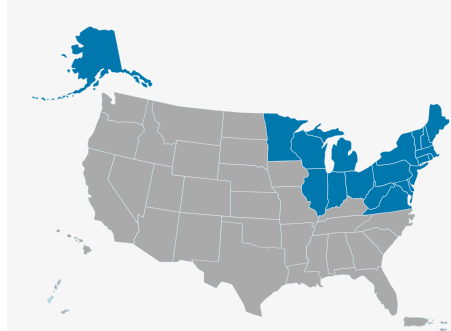
Riverine flooding



Snowmelt



Storm surge



Historical Storms

Winter Storm Elliott was a cross-country storm that turned into a bomb cyclone in 2022. It carried freezing, arctic air to much of the U.S., along with freezing rain and snow. It intensified in the Great Lakes region, bringing blizzard conditions to several states. During this time, the coldest ever windchill of -40 F was recorded by New York's Mesonet stations.

Resources

- *FEMA: Be Prepared for a Winter Storm:* community.fema.gov/ProtectiveActions/s/article/Winter-Storm

Flooding-Related Events That May Not Be Covered by Flood Insurance

The following weather conditions may occur alongside flooding. However, damage sustained during these conditions is typically not covered as they do not meet the NFIP's definition of a flood.

There may be exceptions in some instances. Please contact an insurance agent or carrier for further coverage details.

SLOPE FAILURE

LANDSLIDES & MUDSLIDES

Slope failure is the mass movement of earth material down a slope, including landslides and mudslides.



A landslide involves rocks, earth or other materials moving down a slope. Mudslides are a common type of fast-moving landslide that tend to flow in channels. They develop when water rapidly accumulates in the ground and results in a surge of water-saturated rock, earth and debris.

Landslides and mudslides typically start on steep slopes and are often caused by other weather events such as heavy rain, snowmelt, earthquakes, volcanic eruptions, flooding or changes to land. They are most likely to occur in areas where:

- There are unstable geologic materials (rock and soil);
- Wildfires or human actions have damaged vegetation;
- Slopes have been changed due to construction;
- There are channels by streams and rivers; and/or
- Surface runoff is detected.



SLOPE FAILURE

Onset & Duration

Slope failure can strike with little to no warning and flow quickly. It can be triggered by, and often accompany, other disasters.

Resources

- *FEMA*: Be Prepared for a Landslide: community.fema.gov/ProtectiveActions/s/article/Landslide

WIND-DRIVEN RAIN



Wind-driven rain occurs when wind propels rain into a covered structure.

Natural disasters such as hurricanes, tropical storms and nor'easters can cause wind and flood damage to property.

Affected Communities & Regions

Wind-driven rain occurs in **areas that experience heavy rainfall** or are affected by high-wind, severe weather events.

Resources

- *FEMA*: NFIP Wind Damage vs. Floodwater Damage: What You Need to Know When Filing a Claim: agents.floodsmart.gov/wind-vs-floodwater-damage

Weather Alerts & Advisories

Being able to differentiate between weather alerts and advisories is important for insurance agents, media personnel, property owners and residents. Understanding them can help everyone better protect themselves and their communities in the event of severe weather.

Coastal Flood Advisory

Minor or nuisance coastal flooding is occurring or imminent.

Coastal Flood Watch

Moderate-to-major coastal flooding is possible. If the weather develops as expected, seawater spillage over dune lines and sea walls will occur. Such flooding can pose a serious risk to life and property. Those in the warned area should be prepared to move inland or to higher ground if flooding occurs or warnings are issued.

Coastal Flood Warning

Moderate-to-major coastal flooding is occurring or imminent; seawater spillage over dune lines and sea walls is occurring, imminent or expected within the next 12 hours. This flooding will pose a serious risk to life and property. Those in the warned area should take immediate action to protect lives and property.

Flash Flood Watch

Conditions are favorable for flash flooding. It does not mean that flash flooding will occur, but it is possible.

Flash Flood Warning

Flash flooding is imminent or occurring. Those in a flood-prone area should immediately move to high ground.

Flood Watch

Conditions are favorable for flooding. It does not mean flooding will occur, but it is possible.

Flood Warning

Flooding is imminent or occurring.

Hurricane Force Wind Warning

One or both of the following conditions is expected to begin for locations along the water within 36 hours and not directly associated with a tropical cyclone: sustained winds of 64 knots (74 mph) or greater, or frequent gusts (duration of two or more hours) of 64 knots (74 mph) or greater.

Hurricane Watch

Sustained winds of 64 knots (74 mph) or higher are possible during a tropical cyclone. Because hurricane preparedness becomes difficult once winds reach tropical storm force, the hurricane watch is issued 48 hours in advance of the anticipated onset of high winds.

Hurricane Warning

Sustained winds of 64 knots (74 mph) or higher are expected during a tropical cyclone. Because hurricane preparedness becomes difficult once winds reach tropical storm force, the warning is issued 36 hours in advance of the anticipated onset of high winds.

The warning can remain in effect when high water or a combination of high water and waves continue, even though winds may be less than hurricane force.

Lakeshore Flood Advisory

Minor lakeshore flooding is occurring or possible (12–24 hours in advance).

Lakeshore Flood Watch

Lakeshore flooding that may have serious impacts (12–48 hours in advance).

Lakeshore Flood Warning

Lakeshore flooding that poses a significant threat to life and property is occurring, imminent or highly likely (12–24 hours in advance).

Storm Surge Watch

There is a possibility of life-threatening inundation from rising water moving inland from the shoreline somewhere in the area, generally within 48 hours.

Storm Surge Warning

There is a danger of life-threatening inundation from rising water moving inland from the shoreline somewhere in the area, generally within 36 hours. Check for evacuation orders from your local officials.

Tropical Storm Watch

Tropical storm conditions (sustained winds of 39 to 73 mph) are possible in the area within 48 hours.

Tropical Storm Warning

Tropical storm conditions (sustained winds of 39 to 73 mph) are expected in the area within 36 hours.

Tsunami Watch

Distant tsunami possible; stay tuned for information and be prepared to act.

Tsunami Advisory

Strong currents and waves dangerous to those in/very near water possible; stay out of water and away from beaches and waterways.

Tsunami Warning

Dangerous coastal flooding and powerful currents possible; move to high ground or inland.

Glossary

Review the definitions and/or descriptions of common terms related to flooding and other weather events.

Arroyo/dry wash: Informal name for streams and watercourses in the southwestern U.S. that are only active for part of the year. (pages 12, 32)

Atmospheric river: A relatively long, narrow region in the atmosphere that transports water vapor from the tropics. It's created over the ocean and travels inland as a series of storms. When it makes landfall, it drops a large amount of water on a narrow path, leading to hyper-focused rain or snowfall. (pages 5, 11, 14)

Bomb cyclone: A mid-latitude cyclone that intensifies quickly over a 24-hour period, during which the storm's atmospheric pressure drops significantly. (pages 30, 39)

Burn scar: An area once filled with trees and bushes that has been reduced to ashes and burned soil because of a wildfire. (pages 12, 37)

Dam: A barrier constructed to hold back water and raise its level, forming a reservoir used to generate electricity or as a water supply. (pages 8, 13)

Debris flow: The movement of mud, brush and trees by storm water. It occurs only when flooding or mudflow is the cause of this movement. (pages 12, 13, 36, 37, 38)

Drought: A lack of precipitation over an extended period. (page 32)

Erosion: The process of water breaking down earthen material. (pages 4, 9, 10, 16, 35)

Flash flooding: The rapid onset of flooding following heavy or excessive rainfall. (pages 7, 13, 15, 20, 23, 32, 34, 35, 36, 37, 38)

Flood: As defined by the SFIP:

1. "A general and temporary condition of partial or complete inundation of two or more acres of normally dry land area or of two or more properties (one of which is your property) from:
 - a. Overflow of inland or tidal waters;
 - b. Unusual and rapid accumulation or runoff of surface waters from any source;
 - c. Mudflow.

2. Collapse or subsidence of land along the shore of a lake or similar body of water as a result of erosion or undermining caused by waves or currents of water exceeding anticipated cyclical levels that result in a flood as defined above.” (page 4)

Hurricane: A type of tropical cyclone with sustained maximum winds of at least 74 mph, originating in the Atlantic Ocean or Northeast Pacific Ocean. (pages 22, 41, 42, 43)

Ice jam: A type of damming that occurs when ice chunks become stuck in a narrow passage of a river, potentially leading to riverine flooding. (pages 11, 13, 19, 20, 39)

Kona low: A seasonal subtropical cyclone that tends to form in the winter months near the islands of Hawaii. (page 15)

Landslide: A type of slope failure involving rocks, earth or other materials moving down a slope. (pages 4, 15, 18, 28, 29, 40)

Lakeshore flooding: A type of flood that occurs when water is driven onto the land areas surrounding a lake. This flooding impacts the immediate lakefront, bays and the interfaces of lakes and connecting waterways, such as rivers. (pages 16, 39, 43)

Levee: A man-made structure, usually an earthen embankment, designed to contain, control or divert the flow of water to reduce flood risk. (pages 8, 13)

Megafood: A type of flooding that occurs when a large volume of water is released from behind a “store,” such as an artificial or natural dam. They may also be formed when a landslide, glacier or rockslide blocks a large river, building up and then releasing water. Residents typically receive little warning when a megafood is imminent. (page 8)

Metetsunami: Large waves triggered by air-pressure disturbances often associated with fast-moving weather events, such as severe thunderstorms, squalls and other storm fronts. (pages 16, 28)

Monsoon: A seasonal change in the direction of a region’s strongest winds that can transport moist tropical air to dry desert locations, like the southwestern United States. (pages 32, 36)

Mudflow: A river of liquid and flowing mud on the surface of normally dry land areas, as when earth is carried by a current of water. (pages 4, 6, 12, 18, 36, 37, 38, 47)

Mudslide: A common type of fast-moving landslide that develops when water rapidly accumulates in the ground and results in a surge of water-saturated rock, earth and debris that typically flow in a channel. (pages 6, 15, 38, 40)

Riverine flooding: A type of flooding that occurs when streams and rivers exceed their capacity to accommodate water flow, causing the water to overflow its banks and spill onto adjacent land. (pages 6, 19, 39)

Seiche: A temporary disturbance or oscillation in the water level of a lake or partially enclosed body of water, especially one caused by changes in atmospheric pressure. (page 16)

Spring flooding: Seasonal flooding triggered by warmer weather, snowmelt, increased rainfall and ice jams. (pages 11, 20)

Snowmelt: Melting snow that may result in an increase of runoff and potential flooding. (pages 6, 11, 20, 39, 40)

Slope failure: The mass movement of earth material down a slope, including landslides and mudslides. (pages 4, 18, 40)

Slot canyon: A canyon that was formed over millions of years from water rushing through and eroding the rock (especially sandstone and limestone) that is at risk for flooding during certain seasonal weather patterns. (page 32)

Storm surge: The abnormal rise in seawater level during a storm, measured by the height of the water above the normal tide. (pages 23, 25, 39, 43)

Tropical cyclone: A warm-core, low-pressure system without a “front” that develops over tropical or subtropical waters and has an organized circulation. They can be hurricanes or typhoons, depending on where they originate in the world. (pages 11, 14, 22, 43)

Tropical depression: A type of tropical cyclone that has sustained winds of 38 mph or less. (page 22)

Tropical storm: A type of tropical cyclone that has maximum sustained winds ranging from 39–73 mph. (pages 22, 41, 43)

Tsunami: A series of ocean waves caused by earthquakes or volcanic eruptions under the sea. When this occurs, surges of water, sometimes reaching heights of over 100 feet, are sent onto land. (pages 26, 43, 47)

Typhoon: A type of tropical cyclone with sustained maximum winds of at least 74 mph, originating in the Northwest Pacific. (page 22)

Wind-driven rain: A type of rain event that occurs when wind propels rain into a building. (pages 6, 23, 31, 36, 41)



ADDITIONAL GUIDANCE & CONTACT INFORMATION

This NFIP publication was created with information from state and federal sources, including the United States Environmental Protection Agency (EPA), National Weather Service (NWS), National Oceanic and Atmospheric Administration (NOAA) and the United States Geological Survey (USGS).

Learn more about the impacts of tsunamis and mudflow by downloading the Understanding Tsunamis and Understanding Mudflow fact sheets, respectively, at agents.floodsmart.gov/understanding-tsunamis and agents.floodsmart.gov/understanding-mudflow-fact-sheet.

Review the Climate Change's Impact on Flood Risk booklet to learn how more severe weather events and patterns are increasing the need for flood insurance across the U.S. at agents.floodsmart.gov/climate-change-flood-risk.

Additional details on what NFIP flood insurance covers can be found at floodsmart.gov/whats-covered.

NFIP policyholders who have been impacted by a flood event and need to start a flood insurance claim can visit agents.floodsmart.gov/claims-handbook. Those without flood insurance may review the NFIP's Recovering Financially After a Flood booklet for disaster assistance options at agents.floodsmart.gov/financial-recovery-flooding.

The NFIP offers flood loss avoidance coverage (up to \$1,000) for policyholders to purchase supplies and labor to help protect their insured property against weather events with adequate warning. Visit agents.floodsmart.gov/flood-loss-avoidance to learn more.

For more information on the NFIP, visit floodsmart.gov or contact the NFIP at **877-336-2627**.



FEMA



Congress created the National Flood Insurance Program (NFIP) in 1968 to reduce future flood damage through floodplain management, and to provide people with flood insurance through individual agents and insurance companies. FEMA manages the NFIP.

If you use a relay service, such as video relay service (VRS), captioned telephone service or others, give FEMA the number for that service.

For the most up-to-date version of this resource, please visit agents.floodsmart.gov/nfip-flooding-weather-events.