



सत्यमेव जयते



USAID
FROM THE AMERICAN PEOPLE

WEATHER CLIMATE WATER
TEMPS CLIMAT EAU

Preparation of Operational Flash Flood Bulletins and Warnings



WMO OMM

World Meteorological Organization
Organisation météorologique mondiale

Effective Flash Flood



- An effective flash flood early warning system is critical to disaster risk reduction.
- The development of early warning system is seen as part of the operational responsibility of NMHSs.
- In the WMO Guide to public weather services practices, it is acknowledged that warnings **are only useful** if they are **received, understood, believed and acted upon by those at risk.**



Flash Flood Bulletins, Watches and Warnings

- **To receive** the warning information, users must be aware of the services available and be able to access them.
- **To be understood**, the messages must be clear, concise, and presented within the appropriate social and cultural context.
- **To be believed**, messages must be seen as coming from a credible authority.
- NMHSs must have a **reputation for accuracy, reliability and timeliness.**



Effective warning message

- Effective warning messages are **short**, **concise**, **understandable**, and **actionable**, answering the questions of “**what?**”, “**where?**”, “**when?**”, “**why?**” and “**how to respond?**”.
- The use of plain language in simple, short sentences or phrases enhances the user’s understanding of the warning. In addition, the most important in the **warning should be presented first, followed by supporting information.**

Keep
It
Short and
Simple.



The degree of detail in a warning can vary depending on **its time span** and **the extent of the area to be warned**.

In greater detail, an effective flash flood warning should include:

- warning title,
- date/time of issue,
- issuing source/authority,
- validity period,
- threatened communities,
- headline,
- current intensity of precipitation,
- location of flash flood's most likely impact(s) areas,
- expected consequences,
- level of uncertainty,
- protective action statements,
- source(s) of further information
- and date/time at which or by which the next warning will be issued.





Watches, Warnings & Advisories

Local weather forecast by "City, St" or zip code

Flash Flood Warning

FLASH FLOOD WARNING
 ILC117-119-201645-
 /O.NEW.KLSX.FF.W.0015.160720T1239Z-160720T1645Z/
 /000000.O.ER.000000T0000Z.000000T0000Z.000000T0000Z.OO/

BULLETIN - EAS ACTIVATION REQUESTED
 FLASH FLOOD WARNING
 NATIONAL WEATHER SERVICE ST LOUIS MO
 739 AM CDT WED JUL 20 2016

THE NATIONAL WEATHER SERVICE IN ST LOUIS HAS ISSUED A

- * FLASH FLOOD WARNING FOR...
 SOUTHWESTERN MACOUPIN COUNTY IN SOUTHWESTERN ILLINOIS...
 WESTERN MADISON COUNTY IN SOUTHWESTERN ILLINOIS...
- * UNTIL 1145 AM CDT
- * AT 738 AM CDT...DOPPLER RADAR INDICATED THUNDERSTORMS PRODUCING
 HEAVY RAIN ACROSS THE WARNED AREA. THREE TO FOUR INCHES OF RAIN
 HAS ALREADY FALLEN. FLASH FLOODING IS EXPECTED ACROSS THE WARNING
 AREA.
- * SOME LOCATIONS THAT WILL EXPERIENCE FLOODING INCLUDE...
 GRANITE CITY...ALTON...EDWARDSVILLE...GODFREY...GLEN CARBON...
 WOOD RIVER...BETHALTO...PONTOON BEACH...EAST ALTON...BRIGHTON...
 SOUTH ROXANA...BUNKER HILL...ROXANA...HARTFORD...SHIPMAN...
 WEST ALTON...DORSEY...PRAIRIETOWN...ROSEWOOD HEIGHTS AND CARPENTER.

THIS INCLUDES INTERSTATE 55 IN ILLINOIS NEAR EXIT 23.

THIS ALSO INCLUDES BEAVER DAM STATE PARK.

PRECAUTIONARY/PREPAREDNESS ACTIONS...

TURN AROUND...DON'T DROWN WHEN ENCOUNTERING FLOODED ROADS. MOST FLOOD DEATHS OCCUR IN VEHICLES.

A FLASH FLOOD WARNING MEANS THAT FLOODING IS IMMINENT OR OCCURRING.
 IF YOU ARE IN THE WARNED AREA MOVE TO HIGHER GROUND IMMEDIATELY.
 RESIDENTS LIVING ALONG STREAMS AND CREEKS SHOULD TAKE IMMEDIATE
 PRECAUTIONS TO PROTECT LIFE AND PROPERTY.

&&

LAT...LON 3876 8984 3880 8996 3873 8999 3878 9015
 3881 9012 3885 9011 3893 9028 3900 9027



Flash flood warnings must be initiated, updated, corrected, cancelled and retired as soon as the need arises.



- In many situations, there is insufficient information to forecast flash flood event.
- In such a situation, **community confidence in the NMHS may increase** by issuing an additional level of warning, such as a Precautionary Flash Flood Warning.
- **Any delay in issuing a warning can result in catastrophic losses.**



- As much as is practical, NMHSs should create **standard forms** for text and oral messages and store them for use during future events.
- There is **increased demand from the public and media for graphical presentations of warnings.**
- Keeping in mind that “a picture is worth a thousand words”, graphical products are now being produced by many NMHSs **to complement the textual warning.**
- Graphical products may be delivered via both electronic and print media and should necessarily be **clear, simple, easy to understand, in bold colours, and with significant well-known geographical landmarks and landscape features shown, source acknowledged, time and date of product labelled, and symbols, shades or intensity of colours explained in a key or legend.**



Flash Flood Watch

Areas Heavy Rain Expected Tonight

Timing

- Thunderstorms with heavy rain will develop overnight and last into Wednesday morning

Amounts

- 2-3 inches with locally heavier amounts



Impacts

- Roads could become quickly covered with water
- Urban areas are especially at risk



National Weather Service

Twin Cities/Chanhassen, MN



Issued: 10:34 PM - Tuesday, July 19, 2016

Thunderstorms with heavy rain are expected across eastern MN and western WI overnight. Locations that see this storms could get over 2-3 inches of rain in a short time frame. Stay weather ready if storms develop later tonight, and remember to never cross a flooded roadway!



WMO OMM

Dissemination

- Warnings for flash flood events are mostly up to 6-hours away need to be disseminated **rapidly** through special warning systems using messages that have been designed during calmer times.
- The dissemination process should be **automated** as much as possible to improve efficiency and decrease the time required to issue a warning.
- To maximize chances that warnings will be received, NMHSs are strongly urged to disseminate flash flood warning **via multiple communication channels**, because some communication channels may be more accessible or effective than others.



Dissemination

- Warning information should be disseminated in a wide variety of formats (text, graphical, audio) to **enhance the capability of people with hearing and vision disabilities to receive and understand the information.**
- Some NMHSs disseminate flash flood warnings directly to emergency services. This allows them to organize and/or mobilize necessary response personnel in advance of the public reacting to warnings.



Successful response to flash flood warnings

- Successful response to FF warnings is most likely to occur when the people receiving the warning messages have been **educated** about the particular characteristics of the flash floods, are familiar with the extent of possible damage that could result and have personalized the risk.



Flash Flood Awareness Education

Flash flood awareness education should be delivered in a range of formats via a range of media, such as:

- **Brochures/Pamphlets**
- **Media – TV, Radio, Newspaper**
- **Internet**
- **Public meetings**
- **Educational institutions**
- **Shows/Exhibitions**
- **Service representatives**



Brochures/Pamphlets

- Brochures and pamphlets are relatively cheap to produce and distribute widely.
- They should contain concise information that is simple and instructive.
- They are successful when produced jointly with partners such as emergency services.
- Brochures should look colourful and interesting.
- They must include statements indicating the source of information, the authorities responsible for their production and distribution, and resources for further information.

**PIKES PEAK REGION
PREPAREDNESS GUIDE**
FLASH FLOOD AND DEBRIS FLOW

El Paso County wants you to be prepared for any flooding or debris flow situations. Because of the significant damage incurred from the Waldo Canyon Fire, flooding is not a matter of *if*, but of *when*. We hope the information provided will help you to determine your personal flood risk and to make an emergency response plan for your household. We want you to be equipped with the tools you need to help you make the best decisions possible in an emergency, increasing your ability to survive a disaster.

Preparing makes sense

Take the time to plan for how you will take care of yourself and your family during a flash flood or debris flow emergency. Debris flows and flooding can happen very quickly and you may need to take action before an "official" warning is issued!

BY PLANNING AHEAD YOU CAN:

- Understand how a disaster may affect you and take steps to minimize those effects now. Reduce fear and anxiety by knowing what to do.
- Be self-sufficient for three to five days if first responders can't reach you immediately after a disaster.
- Be ready to help others and allow first responders to help those in the most immediate life-threatening situations.

flash floods

#1 weather-related killer in the United States!

How do flash floods occur?

Several factors contribute to flash flooding. The two key elements are rainfall intensity and duration. Intensity is the rate of rainfall, and duration is how long the rain lasts. Topography, soil conditions, and ground cover also play an important role.



David Vann, The Sentinel-Record, Hot Springs, AR

Flash floods occur within a few minutes or hours of excessive rainfall, a dam or levee failure, or a sudden release of water held by an ice jam. Flash floods can roll boulders, tear out trees, destroy buildings and bridges, and scour out new channels.

Rapidly rising water can reach heights of 30 feet or more. Furthermore, flash flood-producing rains can also trigger catastrophic mud slides. You will not always have a warning that these deadly, sudden floods are coming. Most flood deaths are due to **FLASH FLOODS**.

Most flash flooding is caused by slow-moving thunderstorms, thunderstorms repeatedly moving over the same area, or heavy rains from hurricanes and tropical storms.

Occasionally, floating debris or ice can accumulate at a natural or man-made obstruction and restrict the flow of water. Water held back by the ice jam or debris dam can cause flooding upstream. Subsequent flash flooding can occur downstream if the obstruction should suddenly release.

June 9, 1972 - Black Hills
Rapid City, SD
15 inches of rain in 5 hours
238 fatalities
\$164M in damages
Source: National Weather Service

PLAN AHEAD:
Identify where to go if told to evacuate. Choose several places...a friend's home or a motel in another town, or a shelter.
GO TO HIGHER GROUND!

National Forest FLASH FLOOD BULLETIN

Spring 2013

Be alert for changing weather conditions while visiting the forest.

Always be weather ready.

A **FLASH FLOOD** is a rapid rise of water in a low-lying area, usually created by an intense storm that produces heavy rainfall in a short amount of time.

Flash floods can occur suddenly, on any forest.

Only 24 inches of rushing water can carry away most any vehicle, including SUVs and pickups.

When flood waters rise, climb to safety.

During an intense thunderstorm, a creek only 6 inches deep surrounded by rugged terrain can swell in less than an hour, and become a 10-foot-deep raging river.

The National Weather Service is our nation's exclusive and trusted source for weather forecasts and warnings.

Your safety is your responsibility.

Remember, city sirens don't exist out in nature.

This weather safety bulletin is from the USDA Forest Service and forest managers in your community.

Media – TV, Radio, Newspaper

- For television, short video clips focused on an upcoming flash flood event can be prepared ahead of time and televised as needed. Well-handled live-to-air interviews are an excellent means of both communicating hazard information and building community trust.
- Public radio is widely accessed by the public in most countries and is usually **the preferred media for receiving and/or confirming hazard-warning messages**. This is probably due to a community perception that radio is more reactive and responsive to “update” messages.
- Internet is becoming an increasingly effective way of delivering flash flood awareness education.
- Care must be taken over however, to ensure that the same quality of information that is made available on the Internet is also available via other sources so as not to disadvantage those without access to this technology.

Internet

- **The ability to quickly adapt to emerging communication technology is becoming a key requirement of NMHSs.**
- People expect to be notified about dangerous conditions through a variety of new platforms (mobile phones, tablet mobile computers, etc.) and via social networks.
- The popularity of such platforms and social networks can change quickly, so NMHSs must be equally flexible in order to successfully reach as many people as possible.



US National Weather Service Chicago Illinois
17. srpnja u 23:12 - 🇻🇪

A Flash Flood Warning has been issued from northern Livingston county eastward into portions of northwest Indiana, including southern Newton and southern Jasper counties. Rainfall totals over portions of the warning area could potentially exceed 5 inches by morning. This is a dangerous situation as nighttime flooding is particularly difficult to see. Do not drive into areas where water covers the road!



Flash Flood Warning
Valid Until 6:00 AM CDT Monday July 18, 2016


WHEN FLOODED TURN AROUND DON'T DROWN

Potential Exposure
Population: 35,488
Schools: 27
Hospitals: 1

PBS.TWIMG.COM

Svidi mi se | Komentiraj | Podijeli

Flash Flood Warning NE Denver and adjacent burbs. Up to 1.5" of rain in short time. **TURN AROUND DON'T DROWN #COwx**



WEATHER ALERTS
Flash Flood Warning
FLASH FLOOD WARNING

18:29 - 19. srp 2016

NWS New York NY
@NWSNewYorkNY

A Flash Flood Watch has been issued for today until 6PM. Heavy rainfall this afternoon could lead to urban flooding



Flash Flood Watch – July 7, 2016
National Weather Service – New York, NY

In Effect until 6PM Thursday

Important Details

- Scattered to numerous showers & thunderstorms develop this afternoon.
- Some thunderstorms may be capable of producing up to 2 inches of rain in a quick period.
- Heavy rainfall could lead to urban flooding.

Conditions are favorable for flooding to develop in and around the watch area. Remain alert and stay tuned to NOAA Weather Radio or local media for possible warnings.

40 | 19

03:04 - 7. srp 2016

Examples of flash flood warnings and flash flood watch notifications on Facebook and Twitter



Wireless flash flood alerts

Flash Flood Awareness Education

- To ensure that the population has sufficient knowledge to understand the flash flood risk, public education campaigns should be conducted by NMHSs **on regular and as-needs basis**.
- Public awareness initiatives are generally more effective when they are carried out by an NMHS in partnership with emergency and management agencies.
- Best practice and effective flash flood awareness education campaigns will only be achieved within dynamic and diverse communities by applying a range of educational approaches.
- Public awareness initiatives may be **introduced at any time, and should be ongoing**.

Flash Flood Awareness Education

- NMHSs can improve their public awareness activity through the effective use of their **existing staff**.
- Services can designate and develop a staff member as a public **“focal point”** or **“Service representative”** who is involved in the entire process of working with the users, to access their requirements, to develop products and services to meet their expectations, and to educate them on how to make the most out of information and services provided.

Flash Flood Awareness Education

- A good way for public education is via shows and exhibitions. Forecasters from NMHS should be available to answer public concerns and questions.
- Brochures and other printed materials should be available for interested members of public to take away with them.



Exhibition was visited by more than 83 thousand people.

Flash Flood Awareness Education

- NMHSs can support school-based flash flood awareness education by contributing to the development and production of educational packages to be included in curriculum studies.
- Forecasters can also visit schools, deliver presentations and be available to answer questions.



- To support an effective flash flood warning system, NMHSs should ensure that capacity building of their severe weather warning specialists is high on the national agenda.
- WMO certified trainers would train forecasters from the participant countries, ensuring the continuous training of operational forecasters and enhancing flash flood forecasting and early warning capabilities.
- Training should not be limited to NMHS staff, but must also include specialized agencies that have defined responsibilities and public duties related to flash floods.



- According to Jubach and Sezin Tokar (2016), close **coordination must occur between all sectors and between national and local governments** for the system to function properly, with **clear lines of roles and responsibilities** to avoid confusion and chaos during disasters.
- An important part of the process are the systems enabling user **feedback** to periodically improve and address the needs of decision makers.



- Even the most carefully designed warning system requires continual maintenance to ensure that it will be effective.
- The development and implementation of systems to provide early warnings for flash floods requires data and information **sharing in real time**, and coordination among the government agencies at all levels. It is of primary importance that early warning systems are truly end-to-end in nature.

Thank you

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WMO OMM

World Meteorological Organization

Organisation météorologique mondiale

For more information please visit:

<http://www.wmo.int/ffgs>

<http://www.hrcwater.org>