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A GUIDE TO PUBLIC ALERTS AND WARNINGS FOR DAM AND LEVEE
EMERGENCIES

1. Purpose. To assist the emergency manager in issuing more timely and effective public alert and warning messages for floods caused by dam breaches, controlled dam releases, and levee breaches or overtopping.
2. Applicability. This pamphlet applies to all HQUSACE elements, major subordinate commands, districts, laboratories, centers, and field operating activities.
3. Distribution Statement. Approved for public release. Distribution is unlimited.
4. References. Related references are at Appendix A.

FOR THE COMMANDER:

1 Appendix
A Guide to Public Alerts and Warnings
for Dam and Levee Emergencies


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A GUIDE TO PUBLIC ALERTS and WARNINGS FOR DAM and LEVEE EMERGENCIES



US Army Corps
of Engineers



U.S. ARMY CORPS OF ENGINEERS



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PREFACE

The audience for this guidebook is people involved with providing emergency messages and information to the public during times of impending flooding from dams and levees. This includes:

- emergency management officials
- members of emergency management agencies
- public affairs personnel (public information officers, public affairs officers)
- emergency first responders (incident commanders, police and fire personnel)
- dam and levee owners and operators
- radio and television broadcasters
- public elected officials
- other people or organizations involved with or interested in local emergency management

The term “emergency manager” is used in this guidebook to refer to all members of these groups.



CHAPTER I: SHAPING PUBLIC ACTION WITH EMERGENCY INFORMATION

Most people go through everyday

life thinking they are safe; initial alerts and warnings about imminent threats of community-wide disasters tell people that they are not safe. People's initial reaction to this inconsistency is typically one of denial – it is not happening to me. Emergency messages compel people to search for additional and confirming information by interacting with others. People do this in an effort to form new ideas about the immediate risk they face, and what to do about it. Contrary to popular belief, the public does not panic or act immediately when they hear a warning. The battle that emergency managers must win is one of convincing the public that they are at risk and should take effective action in a timely manner. Aiding them in that battle is the public's desire to have sufficiently detailed information about the situation and what they should do.

Public interaction almost always takes place between receiving a warning and initiating a protective action. This includes searching for additional information about the potential event and what to do about it, confirming that what has already been heard is correct information (such as that the warning recipient is actually at risk), and giving warning information to others. These actions happen regardless of the threat type, the way the warning is delivered, or the source of the warning. Hence, for most people, basic

human nature creates a “response-gap” delay between getting a warning and initiating a protective action. Most people do not take a protective action until they think that the threat communicated in the warning will affect them.

The information that an emergency manager provides can reduce the amount of time that people delay taking a protective action, but delay will never be totally eliminated. It is within the emergency manager's ability to provide the information that the public needs to make quicker and more effective decisions about their protective action behavior. A clear message delivered by the right methods from a formalized plan is the key to success. If the emergency manager does not do this, others will fill the voids with information that may make things worse. The experience and knowledge about what should go into this message, how to word it properly, and when each message should go out is discussed in this document. This document is a guideline for public emergency message communication. The emergency manager can use this guidebook to prepare a plan in such a way that allows successful implementation during an emergency.

Remember these three items:

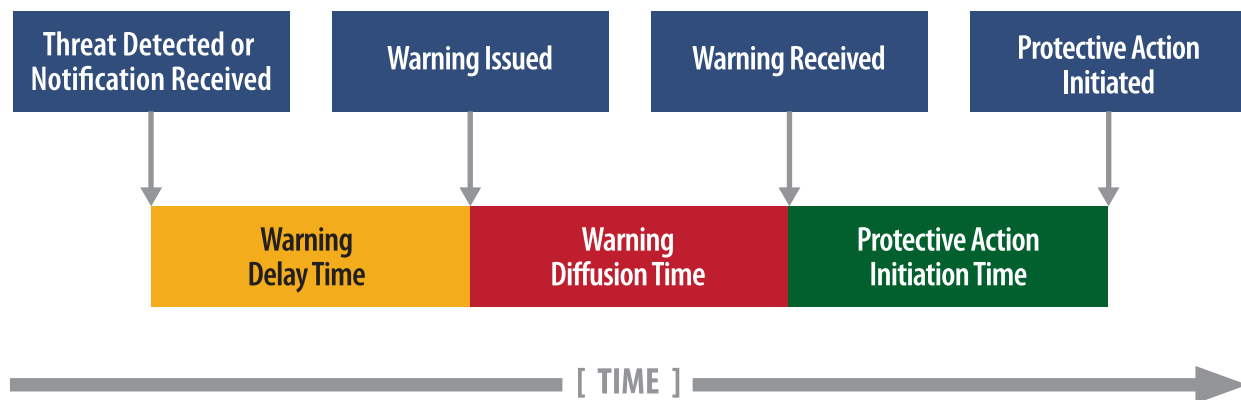
- 1.** People's initial belief is “it is not happening to me.”
- 2.** People do not automatically act on warnings.
- 3.** Information given to the public at the time of the emergency is instrumental in their deciding what to do and how quickly to do it.

The guidebook's purpose is to assist the emergency manager in issuing more timely and effective public alert and warning messages for floods caused by dam breaches, controlled dam releases, and levee breaches or overtopping. The guidebook is not about how to install, maintain and operate emergency public communication technologies. Designing and implementing an effective public education campaign to enhance household preparedness is also outside the scope of this guidebook, although alert/warning topics should be addressed in general public education/information programs.

This guidebook is based on findings from decades of research on disaster warnings. It presents best practices derived from these findings. The guidebook is supported by the data presented in three technical papers on warning issuance, alert/warning diffusion, and public alert/warning response referenced at the end of this document.



FIGURE 1 – WARNING AND PROTECTIVE ACTION INITIATION TIMELINE



WARNING AND PROTECTIVE ACTION PROCESS

The warning and protective action process is divided into the following three time periods that are illustrated in Figure 1:

1. Warning delay time is the period between when a threat is first detected or an emergency manager is first notified of the threat and when an emergency manager issues a first alert/warning.
2. Warning diffusion time is the period after the first alert/warning is issued and the time that people receive that alert/warning.
3. Protective action initiation time is the period after people receive the first alert/warning and when they initiate protective action. In this time period, most people take a range of actions to prepare to implement a protective action and may receive subsequent warning messages.

FORMALIZING A PLAN

The first step in formalizing a warning preparedness plan for issuing warning messages to the public is to decide what should be said in the message. What an emergency manager says in an alert or warning message should vary significantly depending on the level of threat at a dam or levee.

Chapter 2 identifies and categorizes the various threat levels that pertain to dams and levees. It addresses the importance of specifying levels of threat and matching them to public messages as part of the planning process long before an event begins.

The following three topics covered in the guidebook directly relate to the process shown by Figure 1.

Chapter 3 - What to do to minimize the time it takes to make a first public alert/warning.

Chapter 4 - What to do to accelerate the diffusion of the first public alert/warning that is issued.

Chapter 5 - What to do to increase public compliance with recommended actions, and reduce the time that it takes people to begin taking those actions.

The last two substantive topics presented are:

Chapter 6 - Examples of short and longer public emergency messages.

Chapter 7 - Things to consider when selecting alert and warning message dissemination channels.

Chapter 8 summarizes key ideas from the guidebook and refers emergency managers to additional reading.



CHAPTER 2: MATCHING THREAT LEVEL TO PUBLIC PROTECTIVE ACTIONS

STEP 1: INVENTORY PUBLIC PROTECTIVE ACTIONS

The first step is to make a list of all of the different things an emergency manager might ask the public to do to protect themselves in a dam or levee emergency. The audience includes people who are in an area at risk as well as people in adjacent areas who are not at risk. A standard list of actions and associated definitions is presented below. These cover both dam and levee emergencies.

STEP 2: CLASSIFY FLOOD THREAT LEVELS

Once an emergency manager’s public protective action list has been made for dam and levee emergencies, he or she must decide when to recommend those actions based on different levels of flood threat. Effective action plans typically contain three to five classes, for example Level 1, Level 2, Level 3 and Level 4; Red, Yellow and Green; or, Category 1 through 5. The classes should be named with words that make sense to the public, but that also provide a way to group technical threat information. The public generally understands scales such as None, Low, Medium and High. Many threats use the scale of Warning, Watch, Advisory, and Information Statement to correspond with high, moderate, low, and no risk, respectively.

Communication of flood threat information is a challenge and so the distinctions between classes should remain simple for the public to understand when they are faced with making protective action decisions. Probability estimates may cause confusion and reduce protective action compliance by the public. There may be uncertainty about the occurrence of the flood, but there never should be uncertainty in a public alert/warning message about the need to take the recommended protective action.

STEP 3: IDENTIFY DAM AND LEVEE THREATS

The third step to matching threat level to public protective action is to work with the people and organizations that know the most about the performance of the dams and levees and their potential to cause different types of flooding. This includes those that own or operate the dams and levees and those that have determined the effects of releases, breaches, and overtopping. The goal

TABLE 1 - PROTECTIVE ACTIONS LIST

PUBLIC PROTECTIVE ACTION	DEFINITION
Evacuate – Vehicle	Driving away from area at risk
Evacuate – Pedestrian	Moving away from the threat by walking, running or climbing to higher ground
Evacuate – Vertical	Moving to a higher floor in a structure
Evacuate - Safer Structure	Moving to a nearby structure offering more protection
Avoid Area	Not entering an area of potential threat
Expedient* Protection of People	Grabbing hold of a sturdy or floating item
Expedient* Protection of Structures	Improving water resistance or strength of structure (short term – sandbag, seal door frame, etc.)
Expedient* Protection of Possessions	Moving valuables and pets to a safer location
Seek or Monitor Information	Seeking more information about the event and recommended protective actions
Prepare To Evacuate	Packing evacuation kit and supplies, reviewing household plan, securing valuables, contacting others
Continue Normal Activities	Not changing daily behavior

**Expedient refers to actions that require no planning or preparation and are implemented with those resources at hand. Note: The protective actions in this table are not necessarily mutually exclusive.*



TABLE 2 - PROTECTIVE ACTION BASED ON THREAT AREA AND RESPONSE TIME

PROTECTIVE ACTION	FLOOD AREA		ADJACENT AREA
	SHORT TIME	LONG TIME	
Evacuate – Vehicle	✓	✓	
Evacuate – Pedestrian	✓		
Evacuate – Vertical	✓	✓	
Evacuate – Safer Structure	✓	✓	
Avoid Area	✓	✓	✓
Expedient Protection of People	✓		
Expedient Protection of Structures		✓	
Expedient Protection of Possessions		✓	
Seek or Monitor Information		✓	✓
Prepare To Evacuate		✓	
Continue Normal Activities			✓

what might be flooded as a result. They should also be based on the likelihood of a dam breach (i.e. uncontrolled releases). Emergency managers should work with the dam operator, using information about areas that might flood, to determine how various dam safety issues or releases would trigger different threat levels. The dam operator’s emergency action plan (EAP) should include the information needed for assessment of those areas that might flood.

STEP 5: CUSTOMIZE PROTECTIVE ACTIONS BASED ON AVAILABLE RESPONSE TIME

Table 2 outlines the appropriateness of each protective action for people with little time between first alert/warning and flood arrival (Short Time) and people with a lot of time between first alert/warning and flood arrival (Long Time). A third group of people must also be included. These are the people who are adjacent to flood areas (Adjacent Area). Effective warning messages not only tell people what actions to take, but who should not take a specific action.

The mix of appropriate protective actions differs when the public has a short time to respond versus a long time. For example, when people only have a short time to evacuate, they often must do it on foot (pedestrian evacuation). People with longer times available can evacuate by vehicle. In adjacent areas, people should continue their normal activities but avoid the flood threat area.

is to classify different potential dam or levee problems or failure modes into the defined threat levels using information about what areas are impacted and the severity of the impact.

STEP 4: ESTABLISH THRESHOLDS

A formalized and written set of triggers or thresholds should be used to differentiate between flood threat levels so that consistent classification of the threat level will be made. The triggers should be agreed upon in advance by those involved in the operation of the flood defense structure and those responsible for the safety of a given community. Clearly identified trigger points will lead to the appropriate protective action

being communicated to the public and less delay time in communicating the action.

The height of water to overtop a dam or levee is relatively easy to identify, but the other threat level threshold indicators are a bit more complicated to determine. Emergency managers must work with the owner/operator of the dam or levee system to set water levels that may trigger geotechnical or structural failures (leading to breaches) or agree on indications of potential failures (such as sand boils). These items need to be recorded as the specific triggers for moving from one threat level to the next.

The thresholds for dams should be based on the rate of flow of water being released from the dam (i.e. controlled releases) and



STEP 6: BRING IT ALL TOGETHER

The next step is to integrate Steps 1 through 5. This guidebook provides templates for that integration in table format. Tables 3, 4, and 5 present a list of threat levels for dam breaches, controlled dam releases, and levee breaches and overtopping, along with their respective flood threats and corresponding public protective actions. The final choice of protective actions in the

last column of each table will be specific to the community. The first column of Tables 3 and 5 describes observable conditions that would lead to the identification of a given threat level. Developing information about these conditions in an emergency should be based on an interactive process between the dam/levee operator or managers and local emergency managers. Interpretation of the information related to physical observations allows comparisons to be made with trigger threshold levels

that place a situation into one of the threat levels or elevates or decreases the level. As the threat level designation for controlled dam releases is based on the flow rate from the dam and downstream water surface elevations, there is no need for the physical observation column in Table 4. These tables, when fully developed and approved by all involved parties, will become the basis for public protective action planning for dam breaches, controlled releases, and levee breaches or overtopping in the community. As discussed in Step 5, the protective actions in these tables should take into account how flood timing and flood threat will vary with distance from a dam or in different parts of a leveed area.

TABLE 3 - THREAT VS. PUBLIC ACTIONS FOR DAM BREACHES

PHYSICAL OBSERVATIONS*	THREAT LEVEL DESIGNATION	FLOOD THREAT	PROTECTIVE ACTION OPTIONS
Water flowing through breach in embankment	LEVEL IV Dam breaching or breached	Imminent or in progress	<ul style="list-style-type: none"> ■ Evacuate – vehicle ■ Evacuate – pedestrian ■ Evacuate – vertical ■ Evacuate – safer structure ■ Expedient protection of people ■ Avoid area
Rapidly enlarging sinkhole	LEVEL III Dam breach very likely	Very likely	<ul style="list-style-type: none"> ■ Evacuate – vehicle ■ Expedient protection of possessions ■ Avoid area
New seepage areas with cloudy discharge or increasing flow rate	LEVEL II Conditions at dam may or may not lead to breach	Possible but not certain	<ul style="list-style-type: none"> ■ Expedient protection of possessions ■ Seek or monitor information ■ Prepare to evacuate
New seepage areas in or near the dam	LEVEL I Safety issues being investigated	Potential being determined	<ul style="list-style-type: none"> ■ Seek or monitor information

* This column contains examples of physical observations; these observations should be tailored to fit individual projects.

STEP 7: COORDINATE WITH OTHER JURISDICTIONS

The final step in matching threat level to public protective action is coordinating with other jurisdictions (cities or counties) that will be impacted by potential emergency events. The emergency manager should understand which communities are potentially impacted and work with them prior to a dam or levee emergency so that each entity has clear expectations for their roles and actions. Coordination of the content of all emergency information made available to the public, including warning dissemination timing and protective action recommendations, is very important. This will help to ensure that the emergency information that people hear is consistent.



TABLE 4 - THREAT VS. PUBLIC ACTIONS FOR CONTROLLED DAM RELEASES

THREAT LEVEL DESIGNATION	FLOOD THREAT	PROTECTIVE ACTION OPTIONS
LEVEL III Releases exceed or forecast to exceed xxx cfs	Significant for some occupied structures and evacuation routes	<ul style="list-style-type: none"> ■ Evacuate - vehicle ■ Evacuate - pedestrian ■ Avoid Area ■ Expedient protection of structures ■ Expedient protection of possessions
LEVEL II Releases exceed or forecast to exceed yyy cfs	Some near river in unoccupied areas	<ul style="list-style-type: none"> ■ Evacuate - pedestrian ■ Seek or monitor information ■ Avoid area ■ Prepare to evacuate
LEVEL I Releases less than zzz cfs	None outside of channel	<ul style="list-style-type: none"> ■ Evacuate - pedestrian if in or on water ■ Avoid area (water) ■ Continue normal activities

TABLE 5 - THREAT VS. PUBLIC ACTIONS FOR LEVEE BREACHES AND OVERTOPPING

PHYSICAL OBSERVATIONS*	LEVEE THREAT	FLOOD THREAT	ADJACENT AREA
Water flowing through breach in levee embankment	LEVEL IV Levee breached or overtopped	Imminent or in progress	<ul style="list-style-type: none"> ■ Evacuate - vehicle ■ Evacuate - pedestrian ■ Evacuate - vertical ■ Evacuate - safer structure ■ Avoid area ■ Expedient protection of people ■ Expedient protection of structures ■ Expedient protection of possessions
River level forecast to exceed top of levee	LEVEL III Levee starting to breach or overtop	Very likely	<ul style="list-style-type: none"> ■ Evacuate - vehicle ■ Avoid area ■ Expedient protection of structures ■ Expedient protection of possessions
Visual movement/slippage of the embankment slope	LEVEL II Conditions at levee may or may not lead to flooding	Possible but not certain	<ul style="list-style-type: none"> ■ Expedient protection of structures ■ Expedient protection of possessions ■ Seek or monitor information ■ Prepare to evacuate
New seepage areas spotted in leveed area	LEVEL I Safety issues being investigated	Potential being determined	<ul style="list-style-type: none"> ■ Seek or monitor information

* This column contains examples of physical observations; these observations should be tailored to fit individual projects.



CHAPTER 3: MINIMIZING FIRST ALERT/WARNING ISSUANCE DELAY

A good understanding has been developed of what causes some communities to make rapid first alert and warning decisions while others take longer to begin disseminating information. Minimizing delay saves lives and reduces injuries for dam and levee emergencies. The emergency manager can reduce the warning issuance delay time by following the recommendations within the four categories described in this chapter. A checklist of specific actions from each category is included at the end of the chapter.

KEY RECOMMENDATION CATEGORIES

WRITING PLANS

Emergency managers should have written plans in place well in advance of an emergency. Communities that have thought through the first alert/warning decision process and prepared plans, procedures and the relevant tools for arriving at rapid decisions will perform better than those communities who have left decisions to be made in an ad-hoc manner.

PRACTICING

Training on the warning issuance decision process and exercising it on a periodic basis will improve the effectiveness of the decision and issuance process. Moreover, understanding the communications process

and being familiar with the people who will communicate threat level information to the emergency manager will also reduce issuance time. Flexibility in adapting to new and unforeseen situations will also reduce delays.

AVOIDING COMMUNICATIONS BREAKDOWNS

Emergency managers should have ways to communicate with the operators of dams and levees that will work under all circumstances, such as after earthquakes when cell towers may be down and/or telephone land lines are not operating. Hardened and redundant communications technologies such as satellite telephones can prevent these kinds of failures from interfering with making decisions.

CONSIDERING THE CONTEXT

Situational factors beyond the immediate control of emergency managers will impact first alert/warning decision delay times. Decisions are slower when incidents occur during the night. Environmental cues, such as the lack of rain in the at-risk area during a flood event that originates upstream of that area, may cause decision makers to delay decisions. The need to make a first alert/warning decision quickly due to a rapidly developing event can be a strong motivation to reduce delays.



Pentagon evacuation on 9/11 was calm and orderly.

PANIC MYTH

The public does not panic in response to warnings of impending community disasters of any type. The negative consequence of believing that panic will occur is that emergency managers may withhold information because they are afraid of causing panic.



Inadvertent siren soundings perpetuate this myth.

FALSE ALARM MYTH

People's response to warnings is not hindered by what is sometimes called the "cry wolf" syndrome, where predicted events fail to occur. This is especially true if the reasons for the false alarm are clearly communicated to the public. Belief in this myth has caused emergency managers to withhold or delay issuing messages for fear of being wrong.



Hurricane Rita evacuation shows directional and slow movement of traffic sub picture.

TRAFFIC ACCIDENT MYTH

Some emergency managers delay or avoid issuing warnings because of their concern that the process of evacuation will be chaotic and cause increased traffic accidents, injuries, and fatalities. Such is not the case in most evacuations – traffic accidents decrease because traffic is moving at slower speeds, generally in a single direction, and people are more cautious and more considerate.

EMERGENCY MANAGER CHECKLIST

The checklist in Figure 2 presents action steps that can be taken to ensure the community's ability to issue timely and effective first alert/

warning messages. These steps are divided into three categories - those that will have major impacts, modest impacts and minimal impacts on minimizing decision delay time. Each item in the checklist is color coded to signify the category to which it belongs.



FIGURE 2 - FIRST ALERT/WARNING ISSUANCE CHECKLIST

PRIMARY

major impacts on minimizing decision delay time

- A) Emergency public information plan is written down
- A) Standard operating procedures (SOP) to support plan are written down
- A) Triggers (to distinguish flood threat classes and public messages) are in place
- A) Rules and procedures are in place for dam/levee operator - emergency manager communication

KEY RECOMMENDATION CATEGORIES

- A) **WRITING PLANS**
- B) **PRACTICING**
- C) **AVOIDING COMMUNICATIONS BREAKDOWNS**
- D) **CONSIDERING THE CONTEXT**

SECONDARY

modest impacts on minimizing decision delay time

- A) Responsibilities for issuing public emergency information are clearly assigned to those who will do it
- A) The people who have the responsibilities for issuing public emergency information have the legal authority to do it
- B) SOP practice is conducted (drills or exercises)
- D) A procedure for making decisions to release warnings outside of normal working hours is in place
- D) A procedure for providing emergency information when there is an extremely short time to impact relative to the time needed to effectively warn and evacuate is in place
- D) The number of people involved in reaching a warning decision has been minimized

TERTIARY

minimal impacts on minimizing decision delay time

- A) Procedures are in place to pass responsibilities to another person if the designated person is unavailable
- A) Threat verification procedures are defined
- B) Name and telephone number of the operator is known
- B) Routine communications with the operator have been established
- B) Emergency information providers are able to improvise if circumstances keep them from following procedures
- C) Failsafe communication mechanisms are in place for communicating with the operator
- C) Redundancies in communications are in place for communicating with the dam/levee operator
- D) A way to warn the public when the electricity is out has been established



CHAPTER 4: ACCELERATING DIFFUSION OF ALERTS AND WARNINGS

The speed of warning dissemination

(diffusion) varies between communities and events. Some dissemination channels reach more people more quickly than others. Some types of people are easier to reach than other kinds of people. Taking all of these differences into account, the checklist presented in this chapter will help the emergency manager to minimize emergency message diffusion time in the community. The emergency manager can reduce the alert/warning diffusion time by following the recommendations within the two categories described in this chapter. A checklist of specific actions from each category is included at the end of the chapter.

KEY RECOMMENDATION CATEGORIES

SENDING THE FIRST ALERT/WARNING

First alerts/warnings can come from the formal emergency management system, through informal communication processes, or directly from cues in a person's environment. It can be an alert (signal) or a notification (message). Formal alerts and warnings can come via a number of different communication channels involving both new (for example, cell phone or internet) and established (for example, TV, radio, siren, route alert) technologies. Each channel has strengths and weaknesses such as the

**JEFFERSON AND GRANT COUNTIES
EMERGENCY OUTDOOR SIREN SYSTEM**

Whoop Tone Chemical Accident (Actual) at Pine Bluff Arsenal
"Warning: Pine Bluff Arsenal has announced a chemical agent spill. Go inside and tune to your emergency broadcast station for further instructions."

Beep Tone Chemical Accident (Exercise) at Pine Bluff Arsenal
"Attention: This is a test exercise. Attention: This is only a test exercise."

Steady Tone Tornado
"Warning: This is a tornado warning. Residents should take immediate cover. This is a tornado warning."

High-Low Tone Hazardous Material Spill or Accident
A two public address will identify the hazard.

Chime Tone All-Clear Notice
"Attention: Attention: The emergency has ended. Normal activity may be resumed."

***Chime Tone** Test of the Warning System
"This is a test. This is a test of the emergency warning system. This is a test and only a test. The tone is repeated and followed by the voice message: "This has been a test of the emergency warning system. This was only a test!"

Jefferson County OES541-5470
Grant County OES942-3333
*Sirens are tested every Saturday at noon.

Refrigerator magnet defines meaning of 5 different siren signals.

SIGNALS AND LABELS MYTH

The myth is that the public inherently understands a signal or label. People generally do not remember what different signals (for example, siren signal patterns) mean. People do not remember what emergency message labels (for example, watch vs. warning) mean.

speed of dissemination, ability to convey information, and susceptibility to failure. Emergency managers should be aware of the myth of signals and labels (see box above) and adapt their messages accordingly. The rare exceptions to this myth include: (a) in work or school settings, (b) in special situations that can be supported by intensive training programs, or (c) in populations that are repetitively exposed to the same labels (for example, coastal populations repeatedly exposed to hurricane intensity scales).

CONSIDERING YOUR AUDIENCE

The receipt of an alert or warning is also influenced by the characteristics of the people for whom the message is intended. These include the activities that people are engaged in, where they are located, the time of day, reception impediments, and the personal resources available. Examples are people driving a vehicle and people being



A comprehensive warning strategy involves more than pushing a single button.

ONE MAGIC TECHNOLOGY MYTH

There is a tendency to look for a single warning technology that will be 100% effective in delivering a timely message to the public. History shows that there is no one single piece of "magic" that can be relied on to deliver a first alert or subsequent warning to everyone and provide them with sufficient information about the appropriate protective actions to take.



FIGURE 3 - FIRST ALERT/WARNING DIFFUSION CHECKLIST

PRIMARY

major impacts on minimizing diffusion time

A) Procedures to distribute the first message over at least five different communication channels are in place

A) Modern technologies (for example WEA, SMS, dedicated tone alert, broadcast sirens, and automated telephone) are part of the five or more different channels

A) Procedures to repeat dissemination of the message are in place

B) A way to wake people up at night to provide them a first alert/warning is in place

SECONDARY

modest impacts on minimizing diffusion time

B) Special ways to deliver the message to people engaged in unique activities (e.g. boating, camping, in fields, etc.) are in place

B) Special ways to deliver the message to people in unique places (e.g. shopping centers, schools, hospitals, etc.) are in place

B) Special ways to deliver the message to people very close to the dam or levee are in place

B) Special ways to deliver the message to people who are hearing or visually impaired are in place

B) The percentage of the population that cannot be reached by the primary channels is known and have a way to reach them

TERTIARY

minimal impacts on minimizing diffusion time

A) Plans and technology are in place to deliver the message to the public even when infrastructure is disrupted (for example lack of electricity, damaged streets, damaged sirens)

B) Ability to deliver the message to people who only speak a foreign language is in place

KEY RECOMMENDATION CATEGORIES

- A) SENDING THE FIRST ALERT/WARNING**
- B) CONSIDERING YOUR AUDIENCE**

in recreational areas when an emergency occurs. Emergency managers must also consider the impact on the ability to receive an alert or warning if it is nighttime or the intended recipients have hearing impediments.

EMERGENCY MANAGER CHECKLIST

The checklist in Figure 3 presents action steps that an emergency manager can take to ensure the community's ability to issue timely messages. These steps are divided

into three categories - those that will have major impacts, modest impacts, and minimal impacts on minimizing first alert/warning diffusion time. Each item in the checklist is color coded to signify the category to which it belongs.



CHAPTER 5: REDUCING PUBLIC ACTION DELAY AND MAXIMIZING COMPLIANCE



A family listening to a tone alert radio for additional information before evacuating.

IMMEDIATE ACTION MYTH

Contrary to popular belief, people do not immediately act to protect themselves when they hear the first alert/warning. Instead, people seek more information about the impending threat and what they should do about it.

Minimizing protective action

implementation time is the most complex and challenging task that emergency managers will face. It involves skillfully mixing and using knowledge about human behavior, technology, public emergency management, and the physical and engineered environments. The recommendation categories and checklist presented in this chapter will help to minimize the time that it takes people in the community to initiate the protective actions that the emergency manager recommends, as well as to increase public compliance with these recommendations.

KEY RECOMMENDATION CATEGORIES

USING COMPLETE MESSAGES

The characteristics of an alert/warning message influence how much time people delay in initiating a protective action. These characteristics include the content, the style, the nature and frequency of delivery, and the type of recommended protective action contained in the message. As noted by the immediate action myth (see box above), people delay taking protective action unless the message provides a clear explanation of the need for an immediate response. Emergency public messaging plans should provide for the frequent dissemination of

messages in the early stages of emergencies, with sufficiently complete and detailed information. Warning messages simply are not compatible with the need for short messages in, for example, 30 seconds long television and radio advertisements and public service announcements.

The myth about following instructions (see box on page 13) dictates that emergency public warning messages should clearly define the consequences of the pending event and how taking the recommended protective action reduces them.

KNOWING YOUR AUDIENCE

When preparing public alert/warning messages, emergency managers should focus the message to fit their unique community characteristics and the people who live there. These include, for example, comparing the flood that is about to happen to any flood in recent history. Preparing your message to reflect what you have been telling your community in pre-event public education efforts is another example. Emergency managers should effectively distribute the warning in unique ways to people that are in socially isolated groups. They should tell parents what to do about their children in school if school is in session.



SHORT MESSAGES MYTH

Many believe that messages about community-wide disasters must be short or the public's attention will be lost. In fact, people want full information in such events and will remain attentive. People are information hungry in dam and levee emergencies and they should be provided with all the information they need to act quickly and effectively.



People waiting to be rescued after flooding.

FOLLOW INSTRUCTIONS MYTH

It is a myth that people blindly follow instructions in an emergency message. The exception may be when the message provides a strong reason for the instruction and the reason makes sense to the public.

CONSIDERING THE CONTEXT

The context in which the alert/warning message is received influences protective action initiation times. Environmental cues (for example, seeing the flood) and social cues (for example, seeing others evacuating) can stimulate faster response. A person's location, activity, and the time of day when the message is received will shape the timing of his or her response. Finally, the nature of the threat, with regard to the time before impact and its magnitude, will affect public action delay times.

EMERGENCY MANAGER CHECKLIST

The checklist in Figure 4 presents action steps that emergency managers can take to ensure their community's capability to issue effective emergency warning messages. Effective messages help to reduce the time that it takes people in the community to begin the protective actions that the emergency manager recommends and to increase public compliance with these recommendations. The action steps are divided into three categories — those that will have major impacts, modest impacts, and minimal impacts on reducing public protective action initiation time. Each item in the checklist is color coded to signify the category to which it belongs.



FIGURE 4 – PROTECTIVE ACTION INITIATION CHECKLIST

- EXAMPLE MESSAGES OR TEMPLATES**
- include the source of the message
 - include the threat and its consequences
 - include the threat location
 - include the protective action guidance and why it reduces consequences
 - include the time people should begin and complete the protection action
 - provide specificity
 - be clearly written

KEY RECOMMENDATION CATEGORIES

- A) USING COMPLETE MESSAGES**
- B) KNOWING YOUR AUDIENCE**
- C) CONSIDERING THE CONTEXT**

PRIMARY

major impacts on minimizing protective action initiation time

A) Example messages or templates covering the range of possible public actions and threats have been prepared

A) Procedures are in place to deliver messages spoken by a person

A) Procedures are in place to deliver messages repeatedly

B) Example messages or templates address what parents should do if they have children at school

C) Example messages or templates address how people should interpret and respond to environmental cues (e.g. rapidly rising water, flow velocity increases, etc.)

C) Example messages and/or templates include special messages when there is an extremely short time to impact (an hour or less)

C) Example messages and/or templates include special messages when the impact intensity is severe

SECONDARY

modest impacts on minimizing protective action initiation time

A) Example messages or templates are of sufficient length to cover the appropriate content

B) Procedures are in place to issue messages that make comparisons to any recent floods

B) Procedures are in place to communicate the message in special ways to members of socially-isolated groups

C) Procedures are in place to communicate the message in special ways to people engaged in unique activities (e.g. boating, camping, working in fields, etc.)

C) Procedures are in place to communicate the message in special ways to people in unique locations (e.g. shopping centers, schools, hospitals, etc.)

TERTIARY

minimal impacts on minimizing protective action initiation time

B) An ongoing public education program about dams and levees to motivate household preparedness is in place



CHAPTER 6: EMERGENCY MESSAGE TOOLKIT

The single most important thing

that an emergency manager can do to motivate effective public protective action is to provide the best emergency messages possible. The contents of the messages that the public receives in alerts, warnings, and other information is the factor that most influences public protective action-taking behavior in an emergency. This chapter provides emergency managers with the tools needed to write powerful messages for dam and levee emergencies.

PROPERTIES OF AN EMERGENCY MESSAGE

MESSAGE CONTENTS

There are five essential topics for an emergency alert/warning message, and in other emergency public information. These five topics are listed and defined below. Each topic is color-coded to make it easy for the emergency manager to see where these different topics are placed in the example messages and templates contained in this chapter.

SOURCE: say who the message is from

THREAT: describe the flooding event and its impacts

LOCATION: state the impact area boundaries in a way that can be easily understood (for example use street names, landmarks, natural features, and political boundaries)

GUIDANCE/TIME: tell people what protective action to take, the time when to do it, how to accomplish it, and how doing it reduces impacts

EXPIRATION TIME: tell people when the alert/warning expires and/or new information will be received

MESSAGE STYLE

It is important for emergency managers to pay attention to the style used when writing a message. The two style elements that matter the most are specificity and clarity.

Specificity means being precise when the five content elements above are described. For example, telling people, “If you are between the river and First Street, move north of Main Street” instead of simply saying, “Evacuate if you are near the river.”

Clarity means using words that are free of jargon and clearly understood by the people who will receive the message. For example, telling people, “A wave of water 20 feet high moving faster than a person can run will

reach downtown Bakersville by 3:00 p.m.” is better than saying, “A ten thousand cubic feet per second flow, moving at velocities greater than 20 feet per second, will inundate downtown Bakersville by 3:00 p.m.” Instead of saying, “A spillway flowing with an advancing headcut is threatening the control section, which will result in imminent failure of the dam,” the public message should be “The dam is about to fail.”

MESSAGE LENGTH

Short alert and warning messages result in very different public response objectives than longer messages. The emergency manager should understand the differences and apply the appropriate message length for the emergency situation.



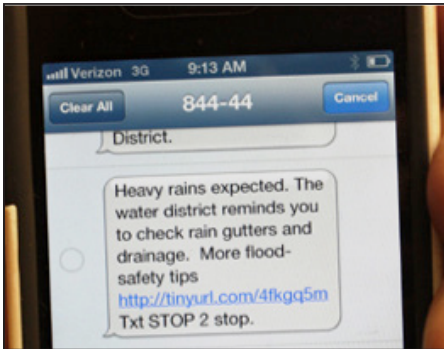
Example of a 90 character message.

Short messages are effective at getting the attention of the people who receive them. They also alert people to the fact that an emergency may exist. However, they do not motivate many people, if any, to take a protective action. They instead motivate



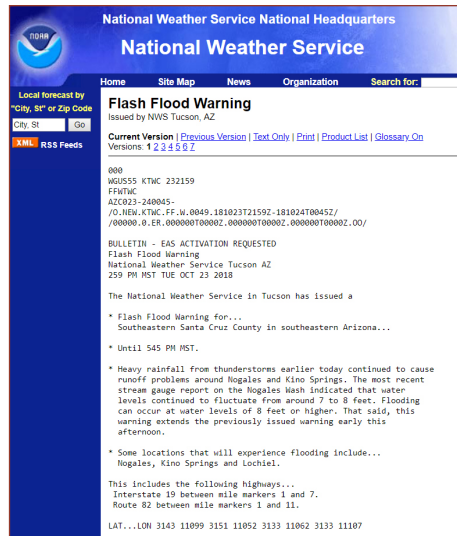
people to search for more information and thereby delay the initiation of a protective action. Short messages include 90-character Wireless Emergency Alert (WEA) messages, 140-character Twitter messages, 160-character Short Message Service (SMS) messages, or messages that conform to the 27-9-3 rule from advertising (27 words in no more than 9 seconds presenting no more than 3 messages).

Longer messages that present relatively complete information can reduce the public's delay in taking protective action. This is important in imminent threat events when time to impact is short. The longer messages and templates in this chapter should be used in these situations to reduce initiation



Text message with website referral.

time. Furthermore, these templates should not constrain emergency managers from presenting additional or more detailed information as necessary for the particular emergency situation.



CONTENTS ORDER

The order of the contents matters for an alert or warning message. The order of contents to achieve maximum effectiveness depends on the message length. It is recommended that public messages used for dam and levee emergencies utilize the following message contents order.

Short messages, for example those that are 90 or 140 characters, work best if the contents are presented in the following order:

- (a) source, (b) guidance and time, (c) threat, (d) location, (e) message expiration time**

Longer messages, for example those that may be part of a press release or a National Weather Service message, work best if the message contents are presented in a different order. Additionally, the time people should begin and/or complete the recommended protection action guidance should be stated

- (a) source, (c) threat, (d) location, (b) guidance and time, (e) message expiration time**

USEFULNESS OF EXAMPLE MESSAGES AND TEMPLATES

Example messages and templates serve a number of significant purposes for an emergency manager. First, it cannot be expected that all emergency managers are familiar with the value of certain content or wording in messaging, so templates and examples provide an effective starting point. Second, messages cannot be written in advance for every emergency scenario. Message templates provide the capability to create specific event messages much more quickly. Example messages and templates are also useful to avoid hastily written content. If messages are not written until the event is happening, the proper care and forethought for effective messaging may not be there. In that same vein, last minute message writing can lead to inconsistencies and mistakes. Finally, example messages and templates provide emergency managers something to practice and hone their skills on.

Message and template examples follow for short and long messages at different threat levels for dam and levee emergencies. An example 90-character WEA message is provided. No WEA template is provided because the contents and their order in a WEA message are set and automatically generated by a machine. Short example messages and templates are provided using 140-character message limits. Longer example messages and templates without character limits are also provided.



MESSAGES AND TEMPLATES FOR DAM BREACH THREAT LEVEL I

90-CHARACTER MESSAGE

The following is an actual example of a 90-character Wireless Emergency Alert (WEA) message for a dam breach at Threat Level I. There is currently no flexibility for local governments in the content and order of a standard WEA message. WEA messages for dam and levee emergencies will always be represented as flash floods.

EXAMPLE:

(c) Flash Flood Watch (d) in this area (e) until 8:00 AM PDT (b) Check local media (a) LCPD

TEMPLATE:

(c) [Insert event type] (d) in this area (e) until [insert time here]
(b) Check local media (a) [insert title and organization of a local, familiar, authoritative message source]

It is required that the time posted in a WEA message be the time when the message is required to expire. Time in a WEA message has nothing to do with when impact might occur, when the public should begin or complete the recommended protective action, or when the threat is over.

140-CHARACTER MESSAGE

The 140-character short message that follows illustrates a message for a dam breach at Threat Level I that could be issued over social media like Twitter which limits length to 140 characters or as a Short Message Service (SMS) message that limits length to 160 characters.

EXAMPLE:

(a) LCPD (b) Check and monitor local media now (c) Explosion at Superior dam Potential damage and flooding (d) in Sherman Heights (e) Message expires 8:00 AM PDT

TEMPLATE:

(a) [insert title and organization of a local, familiar, authoritative message source] (b) Check and monitor local media now (c) [insert description of event, dam name, and threat here] (d) in [insert location of threat here] (e) Message expires [insert time here]

LONGER MESSAGE

There is no limit on the number of characters for a longer message that might, for example, be contained in a press release. Longer messages like the one that follows for a dam breach Threat Level I illustrates the minimum amount of message information that is needed to communicate all relevant content to the public.

EXAMPLE:

(a) Los Cerritos Police Department. (c) An explosion occurred at 5:00 AM PDT today at Superior Dam. The explosion may have damaged the dam. Engineers are examining the dam to determine if there are any safety and downstream flood issues. (d) People in Sherman Heights who are downstream from the dam (b) should check and monitor local media now and continue to do so frequently. There is no reason to do anything more at this time. (e) This message will be updated when new information becomes available.

TEMPLATE:

(a) [insert title and organization of a local, familiar, authoritative message source]. (c) A [insert a brief description of the event] occurred at [insert the time the event occurred] at [insert the name of the dam]. The [insert the same brief description of the event] may have damaged the dam. Engineers are examining the dam to determine if there are any safety and downstream flood issues. (d) People in [insert a brief description of the boundaries of the area at risk] who are downstream from the dam (b) should check and monitor local media now and continue to do so frequently. There is no reason to do anything more at this time. (e) This message will be updated when new information becomes available.



MESSAGES AND TEMPLATES FOR CONTROLLED DAM RELEASES THREAT LEVEL III

90-CHARACTER MESSAGE

EXAMPLE:

(c) Flood Warning (d) in this area (e) until 6:00 PM CST (b) Evacuate (a) NWS

TEMPLATE:

(c) [Insert event type] (d) in this area (e) until [insert time here]
(b) Evacuate (a) [insert title and organization of a local, familiar, authoritative message source]

140-CHARACTER MESSAGE

EXAMPLE:

(a) Jackson Co EMA (b) Evacuate away from Crystal River now (c) Water release from Parker Dam Flooding (d) downstream to US79 (e) Warning expires 6 PM CST

TEMPLATE:

(a) [insert title and organization of a local, familiar, authoritative message source] (b) Evacuate away from [insert river name here] now (c) Water release from [insert name of dam here] Flooding (d) downstream to [insert location of downstream flood boundary here] (e) Warning expires [insert time here]

LONGER MESSAGE

EXAMPLE:

(a) Director of Emergency Management, Jackson County. (c) The Parker Dam north of Kingston on Crystal River will release a large amount of water beginning at 5:00 PM CST. This will cause flooding downstream. The water will reach the Parkside Marina at about 6:03 PM, the Overland Bridge at 6:42 PM, and the northern boundary of Kingston at 6:53 PM. Some structures and roads one-half mile to either side of the river will be flooded to a maximum depth of 3 feet. Roads will be dangerous to travel on or not be passable. (d) The flooded areas will include: from Parker Dam to Kingston's boundary at U.S. 79, and extend from the Crystal River for one-half mile on both sides of the river. The flooded area on the west will include River Bend Road and Bluff Ridge Hwy. On the east, the floodwaters will almost reach Highway 321. (b) If you are in this area, evacuate now. Do not travel on roads along the river or on bridges that cross it. People west of the river should evacuate toward Centerville. People east of the river should evacuate to Highway 321. Take your pets, prescription medications, and important papers with you. You should be out of the evacuation area by 5:00 PM to avoid being impacted by the floodwaters. Do not drive onto water-covered roads because your car may be washed away. Move to the highest level of your home if you cannot evacuate. If you are not in the area, stay out. Keep listening to local media for more information and official updates. (e) This message will be updated in 1 hour, or sooner if new information is available.

TEMPLATE:

(a) [insert title and organization of a local, familiar, authoritative message source]. (c) The [insert name of dam and location here] will release larger than normal amounts of water beginning at [insert time here]. This will cause flooding downstream. The water will reach [insert widely recognizable landmark or location description here] at approximately [insert time here], [insert a subsequent widely recognizable landmark or location description here] at approximately [insert time here], and [insert a subsequent widely recognizable landmark or location description here] at approximately [insert time here]. Some structures and roads one-half mile to either side of the river will be flooded to a maximum depth of [insert number here] feet. Roads will be dangerous to travel on or not be passable. (d) The flooded areas will include: from [insert a description of the northern and southern and eastern and western boundaries of the area, starting from the dam, that will flood using widely identified landmarks and/or roads that is easily understood by everyone here]. (b) If you are in this area, evacuate now. Do not travel on roads along the river or on bridges that cross it. [insert a description of evacuation directions people should take on either side of the river, noting widely identified landmarks and/or roads]. Take your pets, prescription medications, and important papers with you. You should be out of the evacuation area by [insert time here] to avoid being impacted by the floodwaters. Do not drive onto water covered roads because your car may be washed away. Move to the highest level of your home if you cannot evacuate. If you are not in the area, stay out. Keep listening to local media for more information and official updates. (e) This message will be updated in [insert time here], or sooner if new information is available.



MESSAGES AND TEMPLATES FOR LEVEE BREACH THREAT LEVEL III

90-CHARACTER MESSAGE

EXAMPLE:

(c) Flash Flood Warning (d) in this area (e) until 4:00 PM PDT (b) Evacuate (a) NWS

TEMPLATE:

(c) [Insert event type] (d) in this area (e) until [insert time here] (b) [insert expected action] (a) [insert title and organization of a local, familiar, authoritative message source]

140-CHARACTER MESSAGE

EXAMPLE:

(a) Washington Co EMA (b) Evacuate to west of I-15 now (c) Levee breach in Eagle Park Flooding (d) in Riverton south of Highway 8 (e) Warning expires 4 PM PDT

TEMPLATE:

(a) [insert title and organization of a local, familiar, authoritative message source] (b) Evacuate to [insert location here] now (c) [insert description of the initiating event, location, and threat here] (d) in [insert location of threat here] (e) Warning expires [insert time here]

LONGER MESSAGE

EXAMPLE:

(a) Director of Emergency Management, Washington County. (c) The levee in Eagle Park on Muddy River south of Riverton between County Roads 56 and 68 started to breach at 1:04 PM PDT. Flooding has begun and will quickly worsen. There is rapidly moving water that will reach depths of 12 feet, which can injure or drown people, weaken or destroy structures, and wash cars off roads. (d) The flooded areas will include: all of downtown Riverton between Muddy River on the east and I-15 on the west, and from State Highway 8 on the north to Oak Parkway on the south. (b) If you are in this area, evacuate now. Travel west past I-15. Do not go east on Highway 8 over Muddy River. Take your pets, prescription medications, and important papers with you. You should be out of the evacuation area by 2:00 PM to avoid being impacted by the floodwaters. Do not go to schools to get children. School children at Washington Elementary and Lincoln Middle School are being evacuated now. We will give you more information later about how and where to reunite with them. If you are not in the area, stay out. Keep listening to local media for more information and official updates. (e) This message will be updated in 20 minutes or sooner if new information is available.

TEMPLATE:

(a) [insert title and organization of a local, familiar, authoritative message source]. (c) The levee in [describe the levee's location in terms that everyone can understand here] started to breach at [insert time here]. Flooding has begun and will quickly worsen. There is rapidly moving water that will reach depths of [insert depth here] feet, which can [describe impacts on people], [describe impacts on houses], and [describe impacts on cars]. (d) The flooded areas will include: [describe the boundaries of the area that will flood in a way that everyone can understand]. (b) If you are in this area, you should begin evacuating [insert when people should begin evacuating]. [describe the evacuation route or routes people should take and roadways that should be avoided, if any]. Take your pets, prescription medications, and important papers with you. You should be out of the evacuation area by [insert time here] to avoid being impacted by the floodwaters. [insert the following if it is part of the emergency plan: Do not go to schools to get children. School children -- insert name of schools -- are being evacuated now. We will give you more information later about how to reunite with them.] If you are not in the area, stay out. Keep listening to local media for more information and official updates. (e) This message will be updated in [insert number of minutes here] minutes or sooner if new information is available.



TABLE 6 – EXAMPLES AND TEMPLATES SUMMARY

THREAT LEVEL	DAM BREACH			CONTROLLED RELEASE			LEEVE BREACH OR OVERTOPPING		
	90	140	LONG	90	140	LONG	90	140	LONG
I									
II	✓	✓	✓						
III				✓	✓	✓	✓	✓	✓
IV				N/A	N/A	N/A			

ADDING TO THE TOOLBOX

Messages and templates have been provided for three scenarios of dam breach, controlled dam release, and levee breach or overtopping emergency events. If emergency

managers decide to have comprehensive public emergency messages and templates available before emergency events begin, then additional examples and templates should be written. Table 6 highlights the scenarios covered in this guidebook and those

remaining to be written by the emergency manager in order to have a comprehensive toolbox. The blank boxes show what sample messages and templates should be developed for other threat levels under each emergency category.



CHAPTER 7: SELECTING DISSEMINATION CHANNELS

There are many different

communication channels available to disseminate emergency messages to the public. Some of these channels allow information to reach more people more quickly than others. Emergency managers should select an appropriate mix of channels for public message distribution in the community during the planning process, before an emergency occurs.

A variety of low and high technology approaches and systems exist to disseminate messages to the public. No one of these systems is without shortcomings, and each has its own merits. Available dissemination channels include old-fashioned and well understood approaches such as route alerting, loud speakers and public address systems, sirens, and alarms. They also include tried and tested electronic communications such as radio, television, tone alert and NOAA Weather Radio, and reverse telephone distribution systems. These telephone distribution systems have greatly improved in their capacity to call much larger numbers of people at the same time. Dedicated tone alert radios can be installed in homes and buildings in high risk areas such as ones immediately downstream of a dam.

The emerging new approaches to emergency message distribution include the third generation Emergency Alert System.

This system is in varied levels of adoption by different states, counties, and local communities. It includes the Integrated Public Alert and Warning System (IPAWS) and its related Wireless Emergency Alert (WEA) system, which issues 90-character messages (this limit may change in the future) directly to the public over mobile communication devices. These systems hold great promise for dramatically improving first alert notification times. They are currently limited by the degree to which they have been adopted by different jurisdictions, the degree to which people own compatible cell phones that can receive WEAs, and the system design limits. Other new approaches include the use of social media for the distribution of 140-character messages — a practice that is catching on in local communities. Additionally, the Short Message Service (SMS) offered by many different private companies, provides 160-character limit messages to its opt-in subscribers.

No matter what formal channels are used, people will be informally communicating emergency information. Non-official sources, such as broadcast media, will also be warning the at-risk population.

MANY DIFFERENT CHANNELS EXIST

Table 7 lists all of the major channels and classifies each of them in terms of the speed at which each can deliver the message, the coverage area that each channel reaches, the degree to which the channel reaches everyone versus only people in focused locations, and the extent to which each channel can provide detailed information.

RELYING ON ONE CHANNEL IS NOT AN OPTION

A good warning dissemination system will use a mix of channels. The channels chosen may depend on whether it is a first alert/warning message or a subsequent message. Choices may also depend on whom the message is specifically trying to reach.

For disseminating first alert/warning messages, emergency managers should select a mix of channels from Table 7 that maximize the speed at which the message is delivered over a large geographic area and reaches the targeted portions of the public. Note that no one channel can achieve all three of these objectives, nor is there a perfect mix of channels. Emergency managers must make an informed decision and review their choices as new technologies become available.



Warning siren with visual alerting capabilities. Assists with alerting hearing impaired.

When emergency managers need to send subsequent warning messages, their focus should shift toward the content and completeness of those messages. A mix of channels from Table 7 should be chosen that maximizes the degree to which it can provide a comprehensive message over a large geographic area and reach a large portion of the public. Once again, note that no one channel can achieve all three of these objectives, nor is there a perfect mix of channels.

Dealing with specialized subpopulations introduces additional considerations for choosing dissemination channels. Emergency managers should determine what subpopulations exist in the community and decide how to disseminate information to them in an effective manner. Example subpopulations (see Chapter 4) and examples of ways to reach them follow.

- Hearing impaired – text telephone (TDD/TTY)
- Visually impaired – audio text translation
- People close to the dam/levee – sirens, dedicated tone alert radios
- Foreign language speakers – multiple language messages
- People in transit – electronic message boards
- People on/near water – aircraft, sirens
- Institutionalized groups – dedicated tone alert radios, automated telephone dialers
- Schools – dedicated tone alert radios, automated telephone dialers
- Field workers – route notification
- Homeless – route notification

The list from Table 7 can be narrowed for each subpopulation, but the emergency manager may still need to use some judgment in determining the final mix of channels to use.

ADDRESSING RUMORS AND MISINFORMATION

The role of the emergency manager is not limited to giving out information to the public. The role also includes correcting inaccurate information. Emergency managers should find out what wrong information exists by monitoring television and radio broadcasts, and reviewing what people are saying to each other on social media. They can then address and correct rumors and misinformation in subsequent public messages.



TABLE 7 - CHARACTERISTICS OF EMERGENCY MESSAGE DISSEMINATION CHANNELS

DISSEMINATION CHANNELS	SPEED¹	COVERAGE²	CONCENTRATION³	MESSAGE COMPREHENSIVENESS⁴
Route alerting	Slow	Limited	Concentrated	High
Loudspeakers and public address (PA) systems	Fast	Limited	Concentrated	Medium
Wireless Emergency Alerts (WEA)	Very Fast	Widespread	Dispersed	Very Low
Wireless communications (SMS)	Very Fast	Widespread	Dispersed	Very Low
Radio	Moderately Fast	Widespread	Dispersed	High to Low
Television broadcast	Moderately Fast	Widespread	Dispersed	Very High to Medium
Television message scrolls	Moderately Fast	Widespread	Dispersed	Low
Newspaper	Very Slow	Widespread	Dispersed	Very High
Dedicated tone alert radios	Very Fast	Limited	Concentrated	High
Tone alert and NOAA Weather Radio	Fast	Widespread	Dispersed	High
Text Telephone (TDD/TTY)	Fast	Widespread	Dispersed	Low
Reverse telephone distribution systems	Fast	Limited	Dispersed	High
Audio sirens and alarms	Fast	Limited	Concentrated	Very Low
Broadcast sirens	Fast	Limited	Concentrated	Medium
Message boards	Fast	Limited	Concentrated	Low
Aircraft	Slow	Limited	Concentrated	Low
Visual alerting	Fast	Limited	Concentrated	Low
Internet protocol (IP) based technology	Fast	Widespread	Dispersed	Very High to Medium
Social media	Fast	Widespread	Dispersed	Low

1. The rapidness of the system to reach its targeted audience ranges from Very Fast (less than 10 minutes to Slow (greater than 60 minutes).

2. Coverage is the size of the area that can be reached by the channel (Widespread – a large area or Limited – a small area).

3. Concentration is the degree to which the people that the channel reaches are co-located or dispersed (Concentrated – the message is delivered to targeted locations only or Dispersed – the message has the potential to reach everyone).

4. Comprehensiveness, or the ability to convey the content needed for effective response classes, used in this table are as follows: Very Low (alerting only); Low (very little information conveyed); Medium (many but not all essential contents conveyed); High (all relevant content conveyed); Very High (all relevant content conveyed with enhanced graphics).



CHAPTER 8: HAVING AN EFFECTIVE ALERT/WARNING SYSTEM

This guidebook has provided the emergency manager with the following key ideas for developing an alert/warning system for dams and levees:

- Emergency warning information is the single most important factor in getting people to take the best protective action in an emergency. Since members of the emergency management community write the public alert/warning messages, they can greatly influence the public's actions.
- The emergency warning process needs to be planned and is much less likely to be done effectively by reacting during an emergency. Different levels of dam and levee threats should be addressed with different warning messaging strategies.
- It is important that emergency managers, particularly in imminent threat emergencies, are able to quickly decide on issuing an alert/warning. This can be achieved by writing plans, practicing those plans, avoiding communication breakdowns, and anticipating the unexpected.
- Many alert/warning channels can be utilized to deliver emergency information. These channels vary in their speed of message delivery, effectiveness in reaching different kinds of people, and

the degree to which they can provide comprehensive messages. There is no single or short list of channels that can effectively reach everyone. Therefore, a mix of channels is necessary to achieve rapid dissemination of public messages.

- The message content, style, and frequency with which the message is repeated will have a major influence on effective protective action behavior. Short messages do not accomplish this objective. Messages need to be tailored to the unique character of a community. Messages also need to reflect where people are, what they are doing, and the nature of the threat.
- This guidebook, to the extent possible, provides the tools needed to write effective messages. It also provides the information needed to choose the appropriate channels to communicate those messages.

The guidance in this document will assist emergency managers in motivating the public to take protective actions in a dam or levee emergency. There is no failsafe plan, but well-informed, written, and practiced plans work best in reducing public consequences of flooding.

MORE INFORMATION

Further information is provided in the following three technical papers:

Sorensen, J. and D. Mileti (2014a). *First Alert and/or Warning Issuance Time Estimation for Dam Breaches, Controlled Dam Releases, and Levee Breaches or Overtopping*. Draft paper prepared for U.S. Army Corps of Engineers. Institute for Water Resources, Risk Management Center. Davis, CA.

Sorensen, J. and D. Mileti (2014b). *First Alert or Warning Diffusion Time Estimation for Dam Breaches, Controlled Dam Releases and Levee Breaches or Overtopping*. Draft paper prepared for U.S. Army Corps of Engineers. Institute for Water Resources, Risk Management Center. Davis, CA.

Sorensen, J. and D. Mileti (2014c). *Protective Action Initiation Time Estimation for Dam Breaches, Controlled Dam Releases, and Levee Breaches or Overtopping*. Draft paper prepared for U.S. Army Corps of Engineers Institute for Water Resources, Risk Management Center. Davis, CA.

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