TERMINOLOGY AND STANDARDS FOR COMMUNITY-LEVEL FLOOD PREPAREDNESS PROGRAMS

by

Flood Warning and Preparedness Subcommittee
of the ASFPM Flood Mitigation Committee

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INTRODUCTION

Community-level flood preparedness programs have come rapidly to the forefront in recent years as an effective and efficient means of reducing flood losses. Hundreds of such programs are in use across the nation and it appears likely that many more programs will be developed in the near future.

Early programs developed in the mid-1970's tended to be simple, consisting primarily of some volunteer observers and a set of manual procedures for predicting flooding based on the data they provided. The field has progressed much since then. State of the art systems employ self-reporting gages and telemetry to collect data and sophisticated computer models for their analysis.

As the technology has developed, so has the concept of what ought to be encompassed within a community-level flood preparedness program. Today's concept includes emergency response planning to get the most benefit from early warnings, maintenance of the community's program, public information, and other aspects.

The rapid growth of interest in flood preparedness planning has led to use of various terminology in association with the programs. The lack of common terminology has made it difficult for those involved in the programs to communicate effectively with assurance that the listener understands what the speaker means. This has been particularly so with respect to the terms describing the components making up a comprehensive community-level program.

The employment of community-level flood preparedness programs has reached the point that their use would be benefitted by establishing a standard terminology and by setting out some minimum standards for what makes up a comprehensiveprogram.

With a view toward meeting this need, the Association of State Floodplain Managers established a subcommittee to address flood preparedness programs. This Technical Report is the product of that committee. It has three parts:

- Terminology for Flood Preparedness Programs.
- Guidelines for Planning Community-Level Flood Preparedness Programs.
- Standards for Community-Level Flood Preparedness Programs

Development of this report included six rounds of review involving hundreds of floodplain management professionals. All of those concerned with community-level flood preparedness programs are urged to use the designated terminology and familiarize themselves with the guidelines and standards for planning and designing such programs.

PART 1
TERMINOLOGY FOR FLOOD PREPAREDNESS PROGRAMS

Considerable effort went into selecting and defining terms that would enable precise description of comprehensive flood preparedness programs, allow for future developments, and conform to the extent possible to traditional use of terminology in the field of water resources planning and management. The material consists of four parts, namely:

- Glossary definitions of key terms.
- Table 1 listing the six major elements of a flood preparedness program and showing the standard name for each element. Entries under each element indicate some of the kinds of activities usually included in the element.
- Figure 1 illustrating the relationship among key terms with respect to their comprehensiveness.
- Endnotes explaining the reasoning behind some of the terminology choices.

Glossary Definitions

DATA ACQUISITION PROGRAM - The gages, sensors, volunteer observers, and other sources of information and data used for recognition of flood threats along with the equipment, software and other items necessary to transmit the data and information from its place of origination to the point(s) where it is analyzed and the provisions for organizing and displaying the data and information in an understandable form.

MINIMUM DETECTABLE FLOOD - The minimum sized flood that a flood threat recognition system is designed to reliably detect and predict in view of the rainfall recurrence interval, assumed infiltration rates and other factors used for its design. Somewhat analogous to the term "Design Flood" used to mean the magnitude of flood used for design and operation of flood control structures or other protective measures.

EMERGENCY RESPONSE PLAN - The plan for emergency actions to be taken in the period immediately before and during a flood to reduce risk to life and property and to facilitate recovery.

FLOOD PREPAREDNESS PROGRAM - A measure for reducing flood losses which consists of a flood threat recognition system, arrangements and provisions for warning dissemination, emergency response plan, public information program, provisions for maintenance and operation and other essential elements in which all of the elements are properly coordinated and integrated with one another and which: is in written form; has been adopted or otherwise given force by the local legislative body; and has been fully implemented including execution of any necessary contracts and agreements, installation and calibration of equipment, and procurement of needed supplies and material. Unless a modifying adjective such as "limited" is used, a flood preparedness program is assumed to cover all of the

anticipated sources of flooding affecting the designated warning area and to provide both for safety and for reduction of damages and other economic costs associated with flooding throughout the warning area.

FLOOD THREAT RECOGNITION SYSTEM - The data acquisition program plus the equipment, materials and/or procedures used for making a prediction of flow in the warning area based on the available data and information.

FLOOD WARNING PROGRAM - The equipment, supplies, people, organizational arrangements and other components making up the data acquisition network, flood recognition system, and warning arrangements.

MASS WARNING SYSTEM - A system for alerting or warning an area's population of an impending or existing emergency. Systems usually employ sirens, air horns, radio and television and/or other means of communication that require no special effort on the part of the target audience to receive the warning.

POST-FLOOD RECOVERY PLAN - The plan for actions in the immediate post-flood period to reduce health and safety risks, minimize damages, and restore normalcy in the flooded area.

PUBLIC INFORMATION PROGRAM - An assembly of efforts to inform and educate the public about flood-related matters including long-term continuing efforts to create awareness of the flood hazard as well as description of the flood warning system and provision of specific information needed in the pre-flood, during the flood, and post-flood periods.

SPECIAL WARNING RECIPIENT - Person or organization requiring warning earlier then or different than the warning given to the general public. Classification as a special warning recipient is usually based on need for a longer then normal time for response, high loss potential and/or special responsibilities. Special warning recipients are likely to include such persons or organizations as elected officials, emergency services agencies, hospitals, and those responsible for disseminating warnings to the general public.

THRESHOLD FLOOD - The smallest flood flow in an area that causes a risk to life or property that is sufficiently serious to warrant emergency action.

WARNING AREA - The area intended to derive direct benefit from a flood warning program.

WARNING ARRANGEMENTS - Those portions of a flood warning system or flood preparedness program which deal with interpretation of the flood prediction in terms of the area that will be affected, identification of parties to be warned, construction of the warning message(s) and dissemination of warnings.

WARNING LEAD TIME - The length of time between prediction of a flood stage and its occurrence at the upstream end of the warning area. The warning area may be broken into sections and individual warning lead times described for each section.

Table 1

ELEMENTS OF A COMMUNITY-LEVEL FLOOD PREPAREDNESS PROGRAM[1]

Flood Threat Recognition System

- Collection of raw data and information
- Transmission of data and information
- Receipt of data and information
- Organization and display of data and information
- Prediction of expected flow

Warning Arrangements

- Determination of affected areas
- Identification of affected parties
- Deciding the kind and extent of warning needed
- Preparation of warning messages
- Dissemination of warning messages

Emergency Response Plan

- Evacuation subplan
- Evacuee care subplan
- Flood fighting subplan
- Public property protection subplan
- Security subplan
- Maintenance of vital services subplan

Post-Flood Recovery Plan

- Debris clearance subplan
- Return of services subplan
- Damage assessment subplan

Public Information Program

- Continuing public awareness program
- Dissemination of current information

Maintenance Program

- Servicing, repair and replacement of equipment
- Testing, drills and training
- Updating
- Critiques of performance

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1. Subheadings indicate some typical activities. They are not intended to provide a complete listing of possible activities that could make up each element.

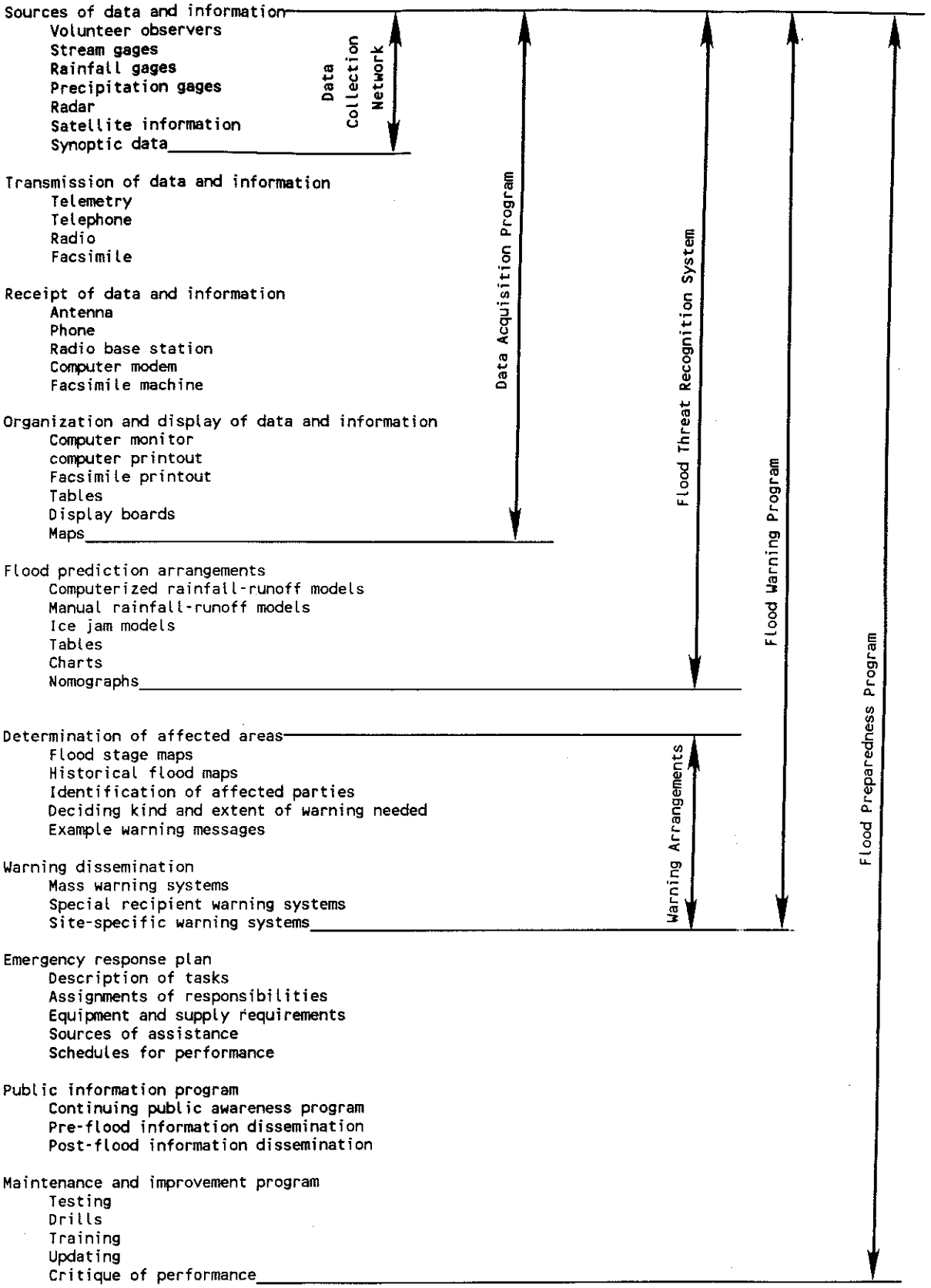

FIGURE 1 ILLUSTRATION OF PROPOSED TERMINOLOGY FOR FLOOD PREPAREDNESS PROGRAMS

PART 1
ENDNOTES

1. The terminology used in Table 1 distinguishes between a "plan" and a "program".

2. The term "Emergency Response Plan" has been used to describe a specific action document. "Flood Preparedness Program" was used in the broader sense to incorporate both specific plans and supporting activities that are maintained over an appreciable period of time.

3. The term "local" as frequently used in "local flood warning program" was avoided because it is not sufficiently descriptive. "Local" is usually used to mean community, county or sometimes regional scope. Therefore, saying "local flood warning... " only means non-federal and non-state and doesn't further define the scope. In addition, some systems being considered are statewide which does not fit in the commonly understood meaning of "local". Consequently, it is recommended that the term "local" be avoided when speaking generically. Appropriate modifiers such as "community", "multi-county", or "basin-wide" can be added in discussing specific programs and systems.

4. Both the terms "flood detection system" and "flood recognition system" have been used in the past and have some merit but an extension of the last, "flood threat recognition system", was considered best. In practice, systems generally "detect" and measure rainfall or tributary inflows and flood threats are only predicted, not directly detected. Even if mainstream flows are measured, the flood that is of interest is the one predicted for the area further downstream. The flood that will actually strike the area of interest cannot be measured in any useful time frame except under unusual topographic conditions. Use of "flood threat recognition system" was also favored because it implies that, while a continuing stream of data is received, some analysis is required to "recognize" those situations that may or will result in floods.

5. Question could exist whether "response plan", "preparedness program" or some other term should have been used in describing the overall concept. The rationale for the use of "Flood Preparedness Program" was that there are some essential aspects of preparedness that are not done in "response" to a flood or a flood warning. For example, maintenance activities and general public awareness programs should be carried on even in the absence of a flood. Viewed like this, the preparedness program encompasses an emergency plan and it is thus more proper to use "preparedness" in the name for the overall measure. The term "flood warning" was omitted from the name of the overall concept on the basis that the warning function is implicit in a comprehensive program and that preparedness better describes the principal theme of the measure.

PART 2
GUIDELINES FOR PLANNING COMMUNITY-LEVEL FLOOD PREPAREDNESS PROGRAMS

The purpose of these guidelines is to assist in formulating an effective and comprehensive community-level flood preparedness program by suggesting the key matters that should be considered in developing the approach to planning.

Objectives

Whatever objectives are set for the flood preparedness program should be described in sufficient detail to guide the planning. Specifically, the description should state whether first priority is to be given to lifesaving, reduction of damages or another purpose. For example, the statement of objectives might state: "1. The primary objective of the flood preparedness program shall be the protection of life; and 2. Secondary objectives, such as reduction of damages and other economic losses, shall only be considered to the extent that the use of available resources for such purposes will not significantly reduce efforts to protect life."

Area to be Considered

The area of the community to be covered by the flood preparedness program should be clearly delineated and the flood preparedness program should be designed to cover all of the delineated area.

The flood preparedness program should consider and provide appropriately for all anticipated sources and causes of flooding potentially affecting the area covered by the program and include consideration of secondary problems associated with flooding.

General Planning Guidance

Investigation and evaluation of flood preparedness programs should be based on adequate understanding of the physical, social, legal and institutional settings in the area to be served as well as realistic assumptions about future conditions. The following matters should be explicitly considered during planning and described in the program documentation.

1. Design of a flood threat recognition system should be based on scientific consideration of meteorologic, hydrologic, and other pertinent factors; make the best use of hardware, software and other resources already in place for the purpose of flood threat recognition; and include an evaluation and description of the capabilities and limitations of the proposed system.

2. The preparedness program should include pertinent interagency and intergovernmental coordination including: a) provisions for use of appropriate information from the National Weather Service and timely provision to the National Weather Service of data and information collected through the program; b) provisions for issuance of warnings to the public to be coordinated with the National Weather Service; and c) full coordination and consistency between the emergency response plan and pertinent city, county and state disaster preparedness programs.

3. All equipment, data transmission standards and data formats employed for a flood threat recognition system should be compatible with those regularly used or recommended by the National Weather Service.

4. Except where impossible or necessary for its proper functioning, all equipment expected to be used in carrying out the flood preparedness program should be located above the estimated level of the 500-year flood including gages, other electronic and/or expensive equipment, and equipment critical to successful operation of the program.

5. Design of the program should include consideration and appropriate documentation of the following:

   A. The legal authority of local, county and state governmental units to carry out any planned role in implementing and operating the flood preparedness program.

   B. Objectives of the flood preparedness program.

   C. Relationships of the flood preparedness program to other plans, programs or provisions for reducing flood losses including those by both other governmental agencies and private sector parties.

   D. Already existing provisions for flood threat recognition, warning and emergency response including equipment in place, assignments of responsibility for operation, performance in past floods, and adequacy of existing arrangements and needs for improvement.

   E. General policies to be followed in operation of the program.

   F. The characteristics of the flood hazard addressed by the program including causes, types, durations, speeds of onset, rates of rise and seasonality of potential floods; past flood events; and other factors or information that significantly influence flood risk or the design of the program.

   G. Nature of the area potentially affected by flooding of various frequencies including location, land use, population, structures and other developments and facilities, vital or critical facilities and services, and other factors that significantly influence flood risk or the design of the flood preparedness program.

   H. Assumptions regarding the conditions considered in designing the flood preparedness program including but not limited to such things as coincidence of flooding from multiple sources, environmental conditions (e.g., weather, ambient noise levels), recurrence interval and duration of rainfall, time of day, and effect of weather and/or flooding on telephone, electrical and other services and key facilities.

   I. The major organizations regularly serving or able to serve the community in the event of a flood emergency and their responsibilities and resources including departments of local government and volunteer organizations.

PART 3
STANDARDS FOR PLANNING COMMUNITY-LEVEL FLOOD PREPAREDNESS PROGRAMS

The following standards relate to the general nature and content of flood preparedness programs and the standards of performance that flood preparedness programs should meet. Compliance with the standards will not necessarily ensure a successful program. However, any program that does not meet each of the standards is likely to be deficient.

1. Flood threat recognition systems must be designed based on:

   A. Analysis of the types, sources and causes of flooding affecting each area within the community.

   B. Analysis of the accuracy and length of warning time required for effective conduct of the preparedness plan.

   C. Determination of the degree of risk of failure or serious error that is acceptable to the community including failure to predict a flood that occurs and prediction of a flood that does not occur.

2. Flood threat recognition systems must be capable of:

   A. Operating under the most adverse conditions likely to exist immediately preceding, during and after a flood including disruption of telephone and regular electrical service unless those systems are adequately floodproofed or have demonstrated their capability to continue functioning under adverse conditions.

   B. Operating with the personnel, equipment and other resources expected to be readily available to local officials in the period immediately preceding and during a flood.

   C. Detecting impending floods from all anticipated sources affecting the area covered by the flood preparedness program.

   D. Determining the approximate magnitude and time of occurrence of impending floods.

3. Flood threat recognition systems must include written procedures for:

   A. Obtaining and appropriately using pertinent meteorologic and hydrologic data and information issued by the National Weather Service.

   B. Monitoring meteorologic and/or hydrologic conditions on a continuous or sufficiently frequent basis at a sufficient number of locations to ensure timely detection of all significant floods with a reliability appropriate to the acceptable risk of failure or serious error.

   C. Analyzing meteorologic, hydrologic, hydraulic and other pertinent data and information and preparing flood predictions.

4. Arrangements for disseminating flood warnings must include:

   A. Provisions for identifying areas affected by various magnitudes of flooding.

   B. Criteria specifying the conditions under which warnings are to be issued for each subdivision of the area covered by the program.

   C. Listing of special warning recipients for each magnitude of predicted flooding.

   D. Description of the means of mass warning dissemination to be used in each affected area including provisions for warning during late night and early morning hours.

   E. Provisions for warning areas on a priority basis where simultaneous warning of all potentially affected areas is not practical.

   F. Examples of messages to be issued to the general public and special warning recipients under various conditions of anticipated flooding.

5. Arrangements for disseminating flood warnings must include written procedures for:

   A. Early alerting of community officials and others responsible for disseminating warnings and/or directing or carrying out emergency response actions, including any needed provisions for ensuring receipt and comprehension of messages.

   B. Issuing early alerts and warnings to special warning recipients.

   C. Mass warning dissemination.

   D. Activating any site-specific warning systems.

6. Arrangements for disseminating flood warnings must provide for:

   A. Warnings to include information that is sufficiently specific to serve as a basis for decision making and action by the public in areas affected by predicted flooding.

   B. Disseminating warnings in a form and language easily comprehended by residents, workers and visitors in each affected area.

7. Emergency response plans must include a description of each response action that is a part of the plan including:

   A. Objective(s) and major steps to accomplishment.

   B. Predicted level of flooding and/or other conditions at which action is to be initiated.

   C. Level(s) of flooding to which applicable.

   D. Responsibility for accomplishment including designation of alternates to personnel with key responsibilities.

   E. Personnel and other resources required for performance.

   F. Any necessary coordination with response plans of other governmental agencies, private sector parties and operators of key facilities.

8. Emergency response plans must include a summary of personnel, equipment, materials and other resources including:

   A. Those required for carrying out all response actions included in the plan and their alternates in the case of personnel.

   B. Those readily available within the community.

   C. Sources of those not readily available within the community.

9. Maintenance arrangements must include provisions for:

   A. Inspecting and/or testing as appropriate, on at least an annual basis, all equipment and materials required for operating the program that are not in regular daily use.

   B. Servicing and maintaining equipment in accord with manufacturers' recommendations and immediate repair or replacement of any malfunctioning equipment.

   C. Personnel and the other resources required to provide maintenance to all elements of the program.

   D. Annually updating all portions of the program including making modifications required due to:

      (1) Obsolescence resulting from turnover of personnel, changes in position titles, and/or changes in telephone numbers and/or addresses.

      (2) Changes in governmental organization, program participants, resources available and/or assigned responsibilities.

      (3) Added or new equipment or other material resources.

   E. Ensuring community officials and others responsible for conduct of the program are aware of their responsibilities for conduct of the program and have the information and training necessary for discharging their responsibilities effectively.

   F. Evaluating the program after each flood or near-flood episode to determine:

      (1) Accuracy of the flood prediction(s).

      (2) Timeliness and thoroughness of warnings (if issued).

      (3) Public response to warnings (if issued).

   G. A specific schedule and/or checklist for:

      (1) Inspecting, testing and maintenance.

      (2) Updating.

      (3) Training.

      (4) Renewing any contracts, memoranda of understanding and/or other agreements affecting operation of the program.

H. Documenting past flood events, including damages, to improve understanding of flood risk and improve future flood predictions.

I. Identifying changes in conditions affecting the expected frequency and/or magnitude of flooding, extent of hazard due to flooding, or area subject to flooding.

10. Public information programs should include provision to the public of appropriate information concerning:

A. Flood hazards in the community.

B. Flood warning arrangements and planned response actions.

C. Means of utilizing flood warnings to improve safety and reduce flood losses.

D. Pre-flood risk mitigation techniques.

E. Post-flood actions to reduce flood losses.