

600 WARNING AND RESPONSE

The activities in this series focus on emergency warnings and response, because adequate notification combined with a plan for how to respond can save lives and prevent and/or minimize property damage. The activities emphasize coordinating emergency management functions with a community's other floodplain management efforts, such as providing public information and implementing a regulatory program. Separate, parallel activities are included for levees (Activity 620) and dams (Activity 630). Credit points are based on threat recognition, planning for a subsequent emergency response, and ongoing testing and maintenance.

Contents of Series 600

Section	Page
610 Flood Warning and Response	610-1
611 Background.....	610-2
612 Elements	610-5
613 Impact Adjustment.....	610-19
614 Credit Calculation.....	610-20
615 For More Information.....	610-21
616 Related Activities under the Community Rating System.....	610-21
620 Levees	620-1
621 Background.....	620-2
622 Elements	620-6
623 Impact Adjustment.....	620-18
624 Credit Calculation.....	620-19
625 For More Information.....	620-19
626 Related Activities under the Community Rating System.....	620-20
630 Dams	630-1
631 Background.....	630-2
632 Elements	630-5
633 Impact Adjustment.....	630-13
634 Credit Calculation.....	630-14
635 For More Information.....	630-14
636 Related Activities under the Community Rating System.....	630-15

List of Figures

610-1. Examples of flood inundation maps.....	610-4
620-1. Delineating the area affected by levee overtopping	620-6

The Community Rating System (CRS) recognizes the importance not only of effective flood warning and response in a comprehensive floodplain management program, but also of coordinating public information, regulatory programs, and flood protection with the efforts of emergency management. Emergency management is included in a number of CRS activities, but especially the three in the 600 series, which focus on specifically on emergency warning and response.

- Activity 610 (Flood Warning and Response) is based on the principle that an ample warning combined with a flood response plan can prevent loss of life and damage to property.
- Activity 620 (Levees) credits the locally coordinated maintenance of levees combined with a flood response plan that recognizes the hazards of levee failure.
- Activity 630 (Dams) recognizes not only that state dam safety programs benefit communities downstream from dams but also that a flood response plan that anticipates possible dam failures can prevent loss of life and damage to property.

The elements and requirements of these three CRS activities have many similarities. They require a positive means of recognizing an imminent threat to the community, an emergency response plan that provides for warning the affected populations, the activation of community emergency response efforts, and giving special attention to critical facilities. Each of the activities also requires public outreach pertaining to flood warning and response, and an annual exercise of the warning and response plan.

Outreach Projects for Flood Warning and Response

Credit for the public outreach that is required for the activities in the 600 series can be credited in Activity 330.

There are differences among these activities, but they should be bound together under the community's emergency response plan. All three have similar credits, organized in the following flood preparedness order:

- Advance notification of an impending flood (threat recognition),
- Issuing warnings to the threatened population (warning),
- Taking steps to protect life and reduce losses during the flood (operations), and
- Coordinating with critical facilities (critical facilities planning).

In all three activities, most of the CRS credit provided is for threat recognition and emergency response planning. In Activities 620 and 630, there is also credit for locally coordinated maintenance of levees and recognition of coordination between communities and state dam safety programs.

610 FLOOD WARNING AND RESPONSE—Summary

Maximum credit: 395 points

612 Elements

- a. **Flood threat recognition system (FTR):** Up to 75 points for a system that predicts flood elevations and arrival times at specific locations within the community.
- b. **Emergency warning dissemination (EWD):** Up to 75 points for disseminating flood warnings to the public.
- c. **Flood response operations (FRO):** Up to 115 points for implementation of specific tasks to reduce or prevent threats to health, safety, and property.
- d. **Critical facilities planning (CFP):** Up to 75 points for coordinating flood warning and response activities with operators of critical facilities.
- e. **StormReady community (SRC):** 25 points for designation by the National Weather Service as a StormReady community.
- f. **TsunamiReady community (TRC):** 30 points for designation by the National Weather Service as a TsunamiReady community.

Credit Criteria

Credit criteria for this activity are described in Section 611.b.

- a. The community must receive some credit for FTR, EWD, FRO, and CFP.
- b. The community must have a description of its flood hazard.
- c. There must be a flood inundation map.
- d. There must be an adopted flood warning and response plan.
- e. There must be one or more outreach projects on the warning and safety precautions.
- f. There must be an annual exercise of the plan with a lessons-learned report.

Each element has additional criteria specific to that element.

Impact Adjustment

The credits for FTR, EWD, and FRO are adjusted based on the number of buildings within the Special Flood Hazard Area affected by each element. There is no impact adjustment for CFP, SRC, or TRC.

Documentation Provided by the Community

Each element has a separate section describing needed documentation.

610 FLOOD WARNING AND RESPONSE

The OBJECTIVE of this activity is to encourage communities to ensure timely identification of impending flood threats, disseminate warnings to appropriate floodplain occupants, and coordinate flood response activities to reduce the threat to life and property.

611 Background

With sufficient warning of a flood, a community and its floodplain occupants can take protective measures such as moving furniture, cars, and people out of harm's way. When a flood threat recognition system is combined with an emergency response plan that addresses the community's flood problems, a great deal of flood damage can be prevented.

The National Weather Service (NWS) issues specific flood warnings for many locations along major rivers and coastlines. Many communities have their own flood threat recognition systems, which enable advance identification of floods on smaller rivers. The full benefit of early flood warning is only realized if the community disseminates the warning to the general public and to critical facilities and has a flood warning and response plan that includes appropriate tasks, such as directing evacuation, sandbagging, and/or moving building contents above flood levels.

A separate publication, ***CRS Credit for Flood Warning and Response Programs***, gives examples of community programs and documentation. Communities are encouraged to read this document before applying for this activity. It will improve the quality of the application and reduce the need for additional documentation later.

For a copy, see Appendix C or www.CRSresources.org/600.

611.a. Activity Description

The maximum credit for Activity 610 is 395 points.

Credit is provided for a community that, at a minimum, has adopted a flood warning and response program that includes

- A flood threat recognition system that identifies an impending flood (credited under FTR),
- Methods to warn the public of the impending flood (credited under EWD),
- A plan for flood response operations (credited under FRO), and
- Coordination with critical facility operators (credited under CFP).

In addition to these four basic parts of a local flood warning and response program, this activity credits two programs operated by the NWS that recognize communities that are better prepared for flooding caused by storms: SRC—StormReady communities and TRC—TsunamiReady communities.

This activity is not intended to be a model for developing a flood warning or flood response program. As with the rest of the Community Rating System (CRS) activities, its objective is

to provide a simple way to measure a local program's potential impact on life, safety, and property damage. An effective flood warning or response program needs to be carefully prepared and tailored to the local flood hazards and the specific needs of the community.

611.b. Activity Credit Criteria

- (1) The community must obtain some credit in the first four flood warning and response elements (FTR, EWD, FRO, and CFP) to receive any credit under this activity.
- (2) The community must have a description of its flood hazard that includes information about
 - (a) The nature of the community's flood hazard, such as flood depths, velocities, warning times, historical flood problems, and special flood-related hazards;
 - (b) The development exposed to flooding, such as the number and types of buildings; land use (residential, agricultural, open space, etc.); critical facilities; and historic flood problem areas; and
 - (c) The expected impacts of flooding on health and safety, community functions, such as police and utility services, and the potential for secondary hazards.

Local governments may have completed a risk assessment that meets this criterion as part of their floodplain management or hazard mitigation plan credited under Activity 510. If not, the community can complete the CRS Community Self Assessment described in Section 240 of the *CRS Coordinator's Manual*. The products from either of these efforts should provide the basis for the flood hazard description.

- (3) The community must have a flood inundation map(s), also known as a flood stage forecast map. The map must show areas that are inundated by at least three different flood or storm surge levels. It is used in planning the community's flood response when different flood levels are predicted. Example maps are shown in Figure 610-1. A community may show that only one flood level is appropriate for some areas of the community, such as for an area subject to shallow flooding. More information on preparing a flood inundation map can be found in *CRS Credit for Flood Warning and Response Programs*.
- (4) The community must have a flood warning and response plan that has been adopted by the community's governing body. A "flood warning and response plan" may have different names in different communities, such as "flood warning plan," "flood preparedness plan," or "flood annex" to an emergency operations plan. To qualify as a flood warning and response plan, the plan must
 - (a) Describe the methods and warning devices used to disseminate emergency warnings to the general public that are credited under EWD,
 - (b) Include specific flood response actions that are taken at the different flood levels that are credited under FRO, and
 - (c) Be adopted by the community's governing body or by an office that has been delegated approval authority by the community's governing body. If the plan is

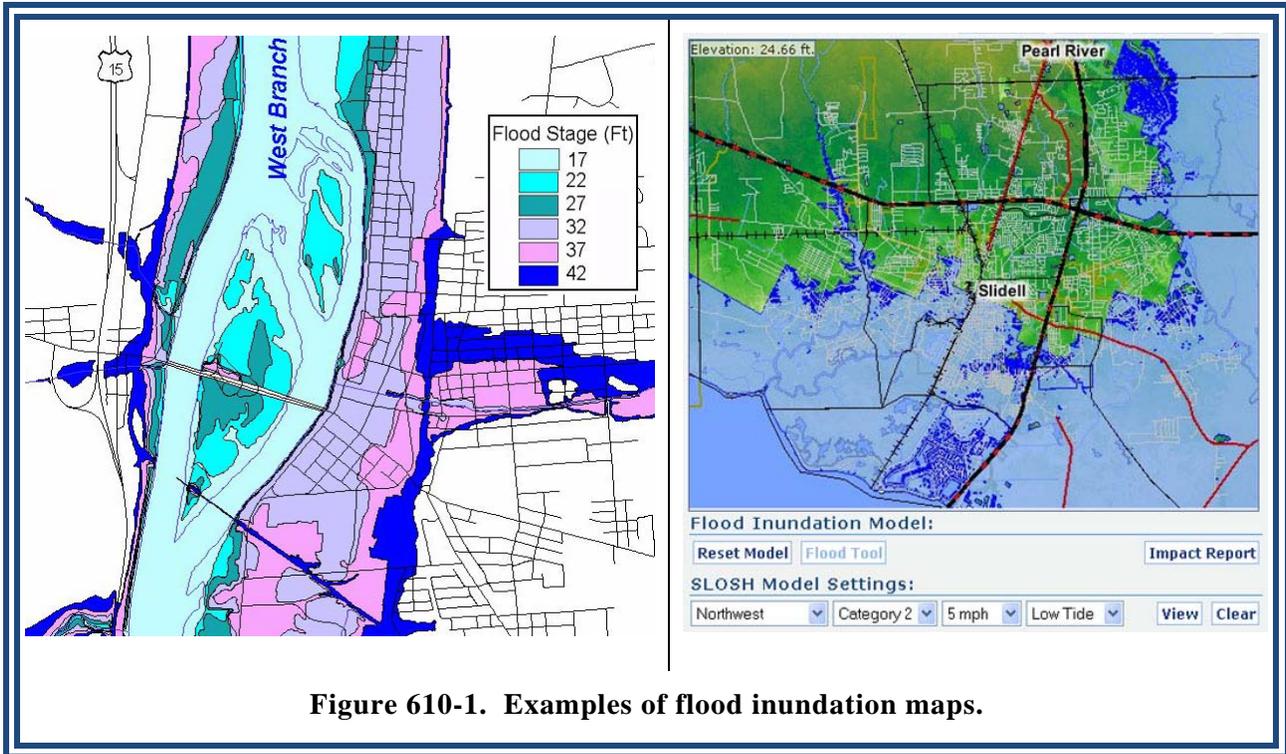


Figure 610-1. Examples of flood inundation maps.

prepared at the county level, it must be adopted by the individual communities seeking CRS credit for it. Annexes, standard operating procedures (SOPs), and other documents developed pursuant to the flood warning and response plan do not require formal adoption by the governing body.

- (5) The community must implement one or more outreach projects that tells its residents and businesses how they will be warned and the safety measures they should take during a flood. This can be done by using one or more of the following approaches:
 - (a) Sending an outreach project (e.g., a brochure, letter, or newsletter) each year to all residents and businesses in the community;
 - (b) Sending an outreach project each year to all residents and businesses in the floodplain where the warning program is in effect;
 - (c) Developing an appropriate approach as part of a Program for Public Information (PPI) credited under Activity 330 (Outreach Projects);
 - (d) If the community has at least three days of advance flood notification, such as coastal areas subject only to tropical storms and hurricanes or communities on large rivers, it may document that it provides repeated watch, warning, and safety information to all residents and businesses, beginning at least 72 hours in advance of the predicted flooding; or

- (e) A community with more than one source of flooding (e.g., coastal and riverine) may need to use different types of projects to reach different audiences.
- (6) There must be at least one exercise and evaluation of the flood warning and response plan each year. The exercise can be for a flood, levee failure, dam failure, or hurricane. This criterion can be met if the plan is implemented in response to an actual flood or threat of a levee failure. In either case, there must be an evaluation of the performance of the plan and recommended changes that may be needed, as is usually done in an after-action report.

612 Elements

612.a. Flood threat recognition system (FTR)

The maximum credit for this element is 75 points.

FTR credit is based on the level of service provided by the community's flood threat recognition system. Level 1 is a manual flood threat recognition system, Level 2 is an automated alarm flood threat recognition, and Level 3 is an automated flood threat warning system.

A flood threat recognition system provides the community with the earliest possible notification that a flood is imminent. The amount of lead time needed between the recognition of a flood and the successful response to a flood warning is a factor in determining the level of flood threat recognition system that is necessary.

Designing an effective flood threat recognition system also depends on knowing what areas of the community are the most vulnerable; what sensor locations will best serve the vulnerable areas; the type and frequency of measurements that are needed; and startup and operational costs.

The flood threat recognition system's level of service is a function of the distribution of gages, population density, and other factors.

- (a) **Level 1: Manual flood threat recognition systems.** A manual system relies on a person to interpret the data received from river and/or tide gages, often using paper tables or graphs. In many cases, the gage data are collected and reported manually, usually by volunteers.
- (b) **Level 2: Automated flood alarm systems.** These systems issue a signal when a flood threatens. When water reaches a certain height on a river or tide gage, an alarm is sent

Annual Warning and Response Exercise

Activities 610 (Flood Warning and Response), 620 (Levees), and 630 (Dams) require an annual exercise of the warning and response plan. A flood, levee failure, dam failure, or hurricane exercise qualifies as an exercise for all three activities.

An evaluation of the performance of the warning and response plan must include

- A description of the exercise;
- An evaluation of the
 - Threat recognition procedures,
 - Warning dissemination,
 - Response operations; and
- Recommended changes to the plan.

The exercise requirement can also be met if the community responds to an actual flood or threat of a levee or dam failure, provided that the items listed above are discussed in an after-action (or similar) report.

to the monitoring location. Unlike automated flood warning systems (credited as Level 3), Level 2 systems do not predict flood heights or provide any data other than the current water level.

- (c) **Level 3: Automated flood warning systems.** These systems provide information such as the timing and potential crest of an oncoming flood. On larger rivers, they may be operated by the National Weather Service (NWS) and the U.S. Geological Survey. Where there are flash floods on smaller rivers, a local ALERT system (Automated Local Evaluation in Real Time) or IFLOWS (Integrated Flood Observing and Warning System) may be established.

In coastal areas, the systems use models like the Sea, Lake, and Overland Surge from Hurricanes (SLOSH) model. These models determine surge heights and delineate the areas of the community that are subject to inundation during a particular category of storm in real time (see the map on the right in Figure 610-1).

A community may determine that different levels of service are appropriate for different sources of flooding in the community (e.g., both riverine and coastal) and may receive FTR credit for more than one system. The credit calculation is based on the levels of service and the number of buildings that benefit from the service.

Credit Criteria

- (1) The activity credit criteria in Section 611.b must be met.
- (2) The community must have a Level 1, Level 2, or Level 3 flood threat recognition system that provides early notice of a flood for at least one location within the community. The system must be able to receive or provide flood warnings 24 hours a day, 7 days a week. A community may have different levels of service for different sources of flooding, and in different locations in the community.
- (3) The flood threat recognition system must be correlated to the flood inundation map, so that the emergency manager can see what areas will be affected by the predicted flood. Generally, this is done by showing areas affected by different flood levels on the map using the same terminology as the flood threat recognition system. An example of this is the riverine map shown in Figure 610-1, which is keyed to the river stages reported by the river gage.

Credit Points

FTR = EITHER:

- (1) 25 points, for a Level 1 manual system, OR
 - (2) 50 points, for a Level 2 automated flood alarm system,
OR
 - (3) 75 points, for a Level 3 automated flood warning system
-

Example 612.a-1.

A community has a NWS river gage at a bridge in the center of town. Data from the gage are automatically transmitted to the NWS Weather Forecast Office and River Forecast Center. The NWS offices process the data and issue notices that include predicted flood crest levels and times. The police department monitors the notices 24 hours a day, seven days a week. FTR = 75

Impact Adjustment

The impact adjustment for the activity is described in Section 613.

Documentation Provided by the Community

(1) At each verification visit,

- (a) The needed documentation is assembled by the ISO/CRS Specialist and provided to the technical reviewer for this activity. There is a checklist to help the emergency manager identify all the needed documentation (available at www.CRSresources.org/600).
 - (i) A copy of the community's flood hazard description (credit criterion (2) in Section 611.b).
 - (ii) A copy of the flood inundation map (credit criterion (3) in Section 611.b).
 - (iii) A copy of the flood warning and response plan and documentation that it has been adopted. If the plan was approved by an office that has been delegated approval authority by the community's governing body, a copy of the delegation authorization. The plan must be marked to show where the credited items appear (credit criterion (4) in Section 611.b).
 - (iv) A description of the flood threat recognition system. The description must identify the rivers, streams, and coastal floodplains where flood stage forecasts are prepared and each forecast point. If the community has its own gage system, such as an ALERT system, the description must include the locations of the stream and precipitation gages.
 - (v) If the community has its own gage system, such as an ALERT system, a copy of the maintenance procedures for the system and records showing that the system is being maintained.
 - (vi) An impact adjustment map showing the area(s) affected by each element and documentation showing how the numbers of buildings used in the calculations were determined.

- (2) At the verification visit and with the annual recertification,
 - (a) A copy of the outreach material used to tell people how they will be warned and the safety measures they should take (credit criterion (5) in Section 611.b). If the outreach material is also credited under Activity 330 (Outreach Projects), a separate submittal is not needed, provided that the other document (including a PPI, if used) is annotated to show where the Activity 610 outreach topics are covered.
 - (b) A description of the flood exercise, drill, or response to an actual emergency or disaster response conducted during the previous year (credit criterion (6) in Section 611.b). The description must include a list of who participated, lessons learned, and any recommendations for changes to the system. A copy of the after-action report or any similar report for any actual response is required.

612.b. Emergency warning dissemination (EWD)

The maximum credit for this element is 75 points.

EWD credit is provided for emergency warning alerts and messages that are disseminated to the public when a flood is imminent.

Flood warning dissemination provides a critical linkage between the recognition of an impending flood and the community's response to the emergency. An example of a dissemination system is the Federal Emergency Management Agency's (FEMA's) Integrated Public Alert Warning System (known as IPAWS). Once the flood threat recognition system tells local emergency managers what will be flooded and when, warnings should be issued to the affected populations. The messages that need to be conveyed and the appropriate times to deliver them should be thought out in advance, as part of the flood warning and response plan.

The warning messages should state when flooding is predicted to occur, its expected severity, and appropriate response actions (e.g., evacuation routes, safe shelters, protective actions).

Special warning arrangements for schools, nursing homes, and other critical facilities are credited under CFP, Section 612.d.

Credit Criteria

- (1) The activity credit criteria in Section 611.b must be met.
- (2) The warning must reach people in a timely manner. For example, television or radio announcements are not credited in areas subject to flash flooding during the night.
- (3) For those warning systems requiring specialized equipment, such as sirens, the equipment and procedures must be tested at least annually. Equipment that is used routinely throughout the year, such as television notices and message boards, do not need testing records for CRS credit.

Credit Points

EWD = the total of the following, up to the maximum of 75 points

EWD1 = 10 points, if the flood warning and response plan includes pre-scripted messages and guidance for staff to quickly issue appropriate flood warnings

EWD2 = 10 points, if the public messages include information and instruction on the expected elevation of the flood waters, and instructions on when to evacuate

EWD3 = 10 points, if an outdoor voice-sound system or fixed-siren system is used

EWD4 = EITHER:

- (a) 5 points, if the plan identifies the primary and support agencies responsible for door-to-door or mobile public address warning; OR
- (b) 15 points, if the plan identifies the routes, procedures, responsible staff, and equipment necessary for door-to-door or mobile public address warning

EWD5 = 10 points, if the Emergency Alert System through all channels/stations with pre-scripted draft messages is used

EWD6 = 15 points, if telephone warning/enhanced telephone notification is used

EWD7 = 10 points, if cable television override systems are used

EWD8 = 10 points, if the community uses other forms of public notification for emergency warnings

EWD9 = 10 points, if all schools, hospitals, nursing homes, prisons, and similar facilities that need flood warning have NOAA Weather Radio receivers and at least one other automated backup system for receiving flood warnings

EWD10 = 10 points, if the flood inundation map is posted online. This can be either a map such as is shown in Figure 610-1 or a map showing just the predicted flood

The procedures and messages should be coordinated with the public information activities credited under flood response preparation (FRP) under Activity 330 (Outreach Projects).

Example 612.b-1.

A community's emergency response plan describes its warning dissemination system. The city receives credit under the following sections under EWD.

EWD1: The plan includes pre-scripted messages and guidance on what warnings to issue, and to whom, when the river is predicted to reach different stages. [10 points]

EWD3: When the flood threat recognition system shows that the river is expected to exceed a flood stage of 30 feet, the police dispatcher sounds the sirens, which are located throughout the community. [10 points]

EWD4: The Police Department sends a squad car along streets in the floodplain to warn residents with its public address system. [15 points]

EWD5: The police dispatcher also activates the Emergency Alert System and advises area radio stations about the hazard, and pre-scripted messages are used. [10 points]

EWD6: The guidance authorizes the police dispatcher to initiate the enhanced telephone notification system. [15 points]

EWD7: The local cable television system programming is overridden with scripted warning messages developed for different flood stages identified in the plan. The messages identify evacuation routes. [10 points]

EWD9: All schools, hospitals, nursing homes, and other group facilities for the care of the elderly that need flood warning have NOAA Weather Radio receivers and at least one other automated backup system for receiving flood warnings. [10 points]

Different messages are used based on the predicted flood stage. Flood stage messages are evaluated each year based on changes in local conditions such as new construction and lessons learned from the annual exercises.

Sirens are tested on the first Monday of each month. The Emergency Alert System is tested every six months. Maintenance of the sirens and communications equipment is provided for by contracts with the manufacturers. The squad cars are used daily, so there is no special testing or maintenance documentation needed for them.

$$\text{EWD} = 10 + 10 + 10 + 15 + 10 + 15 + 10 = 80$$

Because the maximum value for EWD is 75, EWD = 75.

Impact Adjustment

The impact adjustment for the activity is described in Section 613.

Documentation Provided by the Community

- (1) At each verification visit,
 - (a) A copy of the flood warning and response plan, marked to show where the EWD-credited items appear in the plan.
 - (b) Copies of any written warning materials, such as handouts or the flood inundation map credited under EWD 10.
 - (c) [For EWD1, 2, 5, 6, or 7] A copy of the pre-scripted messages.
 - (d) [For EWD3] The impact adjustment map, showing the siren locations and their effective coverage areas.
 - (e) [For EWD6] A copy of the description of a publicly owned call warning system or a copy of the contract with a private provider.
 - (f) [For EWD7] A copy of the cable TV agreement and override procedures.
 - (g) [For EWD8] A description of the capability and use of other forms of public notification.
- (2) At the verification visit and with the annual recertification,
 - (a) The description of the flood exercise, drill, or response to an actual emergency or disaster response conducted during the previous year that notes experiences and lessons learned about the warning dissemination measures.

612.c. Flood response operations (FRO)

The maximum credit for this element is 115 points.

FRO credit is based on the extent of coverage and level of detail that the community's flood warning and response plan provides for the flood response operations.

Flood warning and response planning must identify every opportunity to prevent loss of life and property damage during a flood. Using information from the flood inundation maps, the planning team should think about how flooding would occur—what areas will be affected and when. Through this brainstorming, the team can decide what actions and resources will become necessary.

Developing scenarios can assist this process by helping the community determine what actions it must plan for, and what resources it is likely to need. Scenarios are produced by thinking through what will happen in the community at different levels of flooding (e.g., where will the water go, who will get flooded, who will lose access because of high water, what critical facilities will be affected). By accounting for the local geography, the specific characteristics of the community's residents, and other factors, scenarios help with the design of the response operations so that the threats to life and property at those flood levels can be minimized.

The flood warning and response plan must include appropriate actions to be implemented at the different flood levels shown on the flood inundation map. For each action that needs to be taken, the plan must assign a person or office. See the examples below.

Examples.

- River at elevation 733 feet: notification phase
 - Activate the emergency operations center (emergency manager),
 - Monitor water levels (engineering),
 - Etc.
- River at elevation 736 feet: 25 homes and businesses affected
 - Close [*list the names*] streets or bridges (police),
 - Shut off power to threatened areas (utility company),
 - Etc.
- River at elevation 738 feet: 350 homes and businesses affected
 - Close [*list the names*] streets or bridges (police),
 - Pass out sand and sandbags at [*list the locations*] (public works),
 - Relocate equipment in Fire Station #4 to high ground (fire department),
 - Release children from [*name*] school (school superintendent),
Open evacuation shelters (Red Cross),
 - Establish security and other protection measures (police/sheriff).
 - Etc.

Credit Criteria

(1) The activity credit criteria in Section 611.b must be met.

(2) For full credit for flood response operations, the plan needs to

- (a) Describe the actions to be taken,
- (b) Identify the office or official responsible for the action,
- (c) Define the time needed to carry out the activity, and
- (d) Contain other critical information that designated agencies and organizations will need in order to perform their assigned responsibilities.

General statements or an assignment of responsibilities with no specifics about what is to be done are not credited.

(3) Bonus credit is provided under FRO5 if there is a list of the personnel, equipment, facilities, supplies, and other resources needed to complete each task. For full credit the list must identify what is available within the community and what is needed from private suppliers or other jurisdictions.

The National Incident Management System (NIMS 2007) requires local governments to validate the inventory of response assets using FEMA Resources Typing Standards. Department heads and other emergency response team members should know what kinds of resources they have available. This should be compared with the resources needed. Shortfalls may require negotiating agreements with private suppliers or other jurisdictions.

- (4) FRO6 provides bonus credit for preparing for mitigation opportunities that may arise in the aftermath of a disaster—a time when hazard awareness is high, funds are more likely to be available, and disruption of the status quo makes it possible to rethink the design and location of facilities and infrastructure. This should be coordinated with the public information activities credited under flood response preparations (FRP) under Activity 330 (Outreach Projects), which encourages owners to take mitigation measures during repairs.
- (5) FRO7 provides bonus credits for identifying response and recovery measures to take that support property protection, such as providing a high-ground site for relocated vehicles, helping move building contents, and distributing sandbags.

Credit Points

FRO = the sum of the following, up to the maximum of 115 points:

FRO1 = 15 points, if the community has developed scenarios that review how flood incidents might develop at the different levels shown on the flood inundation map

FRO2 = 2 points, if the plan identifies flood response tasks and responsible community staff and other public and private organizations with responsibilities related to the flood tasks in the plan

FRO3 = 28 points, if specific actions are keyed to the different flood levels shown on the flood inundation map

FRO4 = 10 points, for maintaining a data base of people with special needs who require evacuation assistance when a flood warning is issued and for having a plan to provide transportation to secure locations

FRO5 = Up to 30 points, if the plan includes a summary of estimated staff, equipment, supplies, and time required for each response task and the sources of necessary resources

FRO5 = the sum of the following:

- (a) 10 points, for an estimate of the number of personnel needed for each task,
- (b) 5 points, for an estimate of the time required for each

response task, and

- (c) 15 points, for a list of equipment and supplies expected to be needed and how they will be obtained

FRO6 = Up to 15 points, if the plan includes instructions for

- When and how returning evacuees can reoccupy their damaged homes and businesses,
- Permit requirements,
- Implementing flood loss mitigation measures on community properties, and
- Promoting flood loss mitigation measures for private property

FRO7 = 20 points, if the plan identifies actions that support property protection measures that could be carried out during response and recovery

Example 612.c-1.

A community's emergency response plan includes the following flood response information. The city receives credit under the following sections under FRO:

FRO2 Various public and private organizations are listed, along with their flood response assignments. [2 points]

FRO3 The tasks are tied to specified flood levels of the river. [28 points]

FRO5 The plan lists the staff, equipment, and supplies needed for each response task and the time required for each task. Assets are identified by departments using NIMS resource typing standards. [30 points]

FRO6 Instructions for the return of evacuees to affected areas are also in the plan, including credential instructions and area security assignments. [5 points, partial credit under FRO6]

FRO = 2 + 28 + 30 + 5 = 65

Impact Adjustment

The impact adjustment for FRO is described in Section 613.

Documentation Provided by the Community

- (1) At each verification visit,
 - (a) A copy of the flood warning and response plan, marked to show where the FRO-credited items appear.
 - (b) Copies of the appropriate documents, for the credited items that are not in the flood warning and response plan.
- (2) With the annual recertification,
 - (a) The description of the flood exercise, drill, or response to an actual emergency or disaster response conducted during the previous year, which notes experiences with, and lessons learned from, the flood response operations portion of the plan.

612.d. Critical facilities planning (CFP)

The maximum credit for this element is 75 points.

CFP credit is provided for coordinating the community's warning and response program with its critical facilities.

By definition, "critical facilities" are critical to the community. For CRS credit purposes, critical facilities are defined in Section 120. There are usually two kinds of critical facilities that a community should address with regard to flooding:

- Facilities that are vital to flood response activities or crucial to the health and safety of the public before, during, and after a flood, such as a hospital, emergency operations center, electric substation, police station, fire station, nursing home, school, vehicle and equipment storage facility, or shelter; and
- Facilities that, if flooded, would make the flood problem and its impacts much worse, such as a hazardous materials facility, power generation facility, water utility, or wastewater treatment plant.

Coordinating the flood warning and response planning with these facilities will allow more timely and effective protection of them and more rapid response and community recovery.

Critical facilities may need special early warning. Every facility should have its own individual flood warning and response plan. Not only will this make them better prepared, but also it will reduce the workload on emergency response teams because the critical facilities will be performing some or all of the response themselves.

Credit Criteria

- (1) The activity credit criteria in Section 611.b must be met.
- (2) CFP1 is a prerequisite for any CFP credit.
- (3) For CFP1, the community's flood warning and response plan must list the facilities considered critical in a flood. This can be in a separate document or SOP. In general, facilities not subject to flooding do not need to be addressed, although in some cases

loss of access can cause a critical situation. There may also be facilities in flood-free sites that are needed to support the flood response effort (e.g., sandbag suppliers and shelters for evacuees). The list must be updated at least annually.

The community must also contact the facilities to determine if they need any special warning arrangements. For example, a factory where there is a lot of noise may need a direct telephone call because no one would hear a siren. Another facility may need an earlier notice because it needs more time to get ready.

The community does not need to provide a special warning to all critical facilities, only those that need one.

- (4) For CFP2, additional credit is provided if flood warning and response plans have been developed, reviewed, or accepted by the community for individual critical facilities.

Credit Points

CFP = the sum of the following, up to 75 points:

CFP1 = up to 25 points, if the flood warning and response plan includes

- (a) the names and phone numbers of the operators of all public and private critical facilities affected by flooding, and
- (b) arrangements for special warnings or early notifications directly to those critical facilities that need advanced warning

CFP2 = up to 50 points, if critical facilities listed under CFP1 have their own flood warning and response plans that have been developed, reviewed, or accepted by the community. The credit is prorated based on the percentage of affected critical facilities that have creditable plans

Example 612.d-1.

A community's multi-hazard plan lists all critical facilities in the community, their operators, and their telephone numbers. The list is updated by the emergency manager every six months. There are three critical facilities affected by flooding: the public works garage, a church, and a school. The first is in the floodplain and the last two are adjacent to the floodplain but are needed as shelters as described in the flood warning and response plan. The community's plan includes providing special warnings to these three facilities. CFP1 = 25 points

$$\text{CFP} = 25 + 0 = 25$$

Impact Adjustment

There is no impact adjustment for CFP.

Documentation Provided by the Community

(1) At each verification visit,

- (a) A list of all public and private critical facilities affected by flooding or needed to be operational during a flood, with the contact information and agreed-upon warning needs.
- (b) [For CFP2] The list of critical facilities marked to identify those that have developed their own flood warning and response plans that have been reviewed and accepted by the community. The ISO/CRS Specialist will ask for samples of the plans for review.

(2) With the annual recertification,

- (a) A page from the latest list of the critical facilities provided for CFP1 that must be updated at least annually.

612.e. StormReady community (SRC)

The maximum credit for this element is 25 points.

SRC credit is provided to communities that have received a StormReady designation from the NWS.



StormReady is a nationwide community preparedness program that uses a grassroots approach to help communities develop plans to handle all types of severe weather—from tornadoes to tsunamis. The program encourages communities to take a new, proactive approach to improving local hazardous weather operations by providing emergency managers with clear-cut guidelines on how to improve their hazardous weather operations.

To be officially StormReady, a community must

- Establish a 24-hour warning point and emergency operations center;
- Have more than one way to receive severe weather warnings and forecasts and to alert the public;
- Create a system that monitors weather conditions locally;
- Promote the importance of public readiness through community seminars; and
- Develop a formal hazardous weather plan, which includes training severe weather spotters and holding emergency exercises (see www.stormready.noaa.gov/basics.htm).

There are more than 2,000 StormReady communities in the United States. StormReady credits communications and educational requirements that go beyond the elements credited by the CRS. Because of the advantages of being a StormReady community, this element provides credit to encourage communities to qualify.

Credit Criteria

- (1) The activity credit criteria in Section 611.b must be met.
- (2) The community must be designated as a StormReady community by the NWS.

Credit Points

SRC = 25, for being designated by the NWS as a StormReady community and meeting all credit criteria

Impact Adjustment

There is no impact adjustment for SRC.

Documentation Provided by the Community

No documentation is required from the community. Credit is based on the list of StormReady communities posted on the NWS website, www.stormready.noaa.gov.

612.f. TsunamiReady community (TRC)

The maximum credit for this element is 30 points.

TRC credit is provided to communities that have received a TsunamiReady designation from the NWS.



The TsunamiReady program is the NWS's counterpart to StormReady for communities that are exposed to a tsunami hazard. There are over 100 TsunamiReady communities in the country. A community can participate in both programs and receive credit for both elements, SRC and TRC.

Credit Criteria

- (1) The activity credit criteria in Section 611.b must be met.
- (2) The community must be designated as a TsunamiReady community by the NWS.
- (3) The community must meet the CRS tsunami hazards mapping requirements identified in *CRS Credit for Mitigation of Tsunami Hazards*. It may be downloaded from www.CRSresources.org or a hard copy may be ordered (see Appendix C).
- (4) The community must have adopted a tsunami hazards operations plan that describes the actions the community is to take upon receiving a tsunami warning.

Credit Points

TRC = 30, for being designated by the NWS as a TsunamiReady community and meeting all credit criteria

Impact Adjustment

There is no impact adjustment for TRC.

Documentation Provided by the Community

(1) At each verification visit,

- (a) A copy of the tsunami hazards map and a description of how it was prepared; and
- (b) A copy of the tsunami emergency operations plan.

No documentation is required of communities to demonstrate their TsunamiReady status. Credit is confirmed based on the list of TsunamiReady communities posted on the NWS website, www.tsunamiready.noaa.gov.

613 Impact Adjustment

The credit points for FTR, EWD, and FRO are adjusted based on the number of buildings affected by the element. Determining these adjustments usually will require identifying the area affected and then counting the buildings within that area.

$$(1) rFTR = \frac{bFTR}{bSF}$$

$$(2) rEWD = \frac{bEWD}{bSF}$$

$$(3) rFRO = \frac{bFRO}{bSF}, \text{ where}$$

bFTR = the number of buildings that benefit from the level of the flood threat recognition system,

bEWD = the number of buildings that benefit from the flood emergency warnings,

bFRO = the number of buildings in the area covered by the flood response operations, and

bSF = the number of buildings in the Special Flood Hazard Area, and

bFRO cannot be greater than bEWD
 bEWD cannot be greater than bFTR
 rFTR cannot be greater than 1.0

See Section 301 for more information on counting buildings for impact adjustments. Note that bSF includes all buildings in the Special Flood Hazard Area (SFHA), but bFTR, bEWD, and bFRO can include buildings outside the SFHA that benefit from the flood warning and response plan. The maximum impact adjustment is 1.0. For example, a

community with a plan for up to a category 5 hurricane may be providing a safety benefit for many buildings on ground higher than that flooded by the base flood.

In general, $bFTR = bEWD = bFRO$, because the flood warning and response plan will provide the same level of services to the same areas. There may be cases in which the flood threat recognition system covers a larger area than a detailed flood warning and response plan, so their impact adjustments are calculated separately.

Example 613-1.

The community in the previous examples has a warning and response program for its major river. It does not have a program for three small streams that affect a portion of its SFHA. There are 452 buildings within the community’s SFHA. Its flood warning and response plan covers the 410 buildings that are in the major river’s floodplain.

$$bFTR, bEWD, \text{ and } bFRO = 410$$

$$bSF = 452$$

$$rFTR = \frac{bFTR}{bSF} = \frac{410}{452} = 0.91 \quad rEWD = \frac{bEWD}{bSF} = \frac{410}{452} = 0.91$$

$$rFRO = \frac{bFRO}{bSF} = \frac{410}{452} = 0.91$$

614 Credit Calculation

The credit points for each element are multiplied by the impact adjustment ratios and the products are totaled.

$$c610 = (FTR \times rFTR) + (EWD \times rEWD) + (FRO \times rFRO) + CFP1 + CFP2 + SRC + TRC$$

Example 614-1.

The community’s flood warning and response program is described in the previous sections’ examples.

$$FTR = 75 \quad rFTR = 0.91$$

$$EWD = 75 \quad rEWD = 0.91$$

$$FRO = 65 \quad rFRO = 0.91$$

$$CFP1 = 25 \quad CFP2 = 0$$

$$\text{SRC} = 25$$

$$\text{TRC} = 0$$

$$\text{c610} = (\text{FTR} \times \text{rFTR}) + (\text{EWD} \times \text{rEWD}) + (\text{FRO} \times \text{rFRO}) \\ + \text{CFP1} + \text{CFP2} + \text{SRC} + \text{TRC}$$

$$\begin{aligned} \text{c610} &= (75 \times 0.91) + (75 \times 0.91) + (65 \times 0.91) + 25 + 0 + 25 + 0 \\ &= 68.25 + 68.25 + 59.15 + 25 + 25 + 0 \\ &= 245.65 = 246 \text{ (rounded)} \end{aligned}$$

615 For More Information

- a. Additional information, reference materials, and examples can be found at www.CRSresources.org/600.
- b. *CRS Credit for Flood Warning and Response Programs* can be obtained online at (www.CRSresources.org/600) or a hard copy can be ordered (see Appendix C).
- c. *Flood Warning Systems Manual*. National Weather Service Manual 10-942. Operations and Services Hydrologic Services Program, NWSPD 10-9. 2010. Silver Spring, MD: Department of Commerce, NOAA, www.nws.noaa.gov/os/water/ahps/resources/Flood_Warning_Systems_Manual.pdf.
- d. CPG 101: *Developing and Maintaining State, Territorial, Tribal and Local Government Emergency Plans*. March 2009. Washington, D.C.: Federal Emergency Management Agency. www.fema.gov/pdf/about/divisions/npd/CPG_101_V2.pdf.

616 Related Activities under the Community Rating System

- Developing an appropriate outreach approach to the residents as required in Section 611.b(5) as part of a Program for Public Information can be credited under Activity 330 (Outreach Projects).
- FTR is similar to element LFR under Activity 620 and element DFR under Activity 630. It credits a system that provides the community with the earliest possible notification that a flood is imminent. The three threat recognition systems should be closely coordinated.
- EWD is similar to element LFW under Activity 620 and element DFW under Activity 630. It credits a flood warning dissemination system that provides a critical link between the recognition of an impending flood and the community's response to the emergency. The three warning dissemination systems should be closely coordinated.
- FRO is similar to element LFO under Activity 620 and DFO under Activity 630. It identifies opportunities to prevent loss of life and property damage during a flood. The three response operations plans should be closely coordinated.

- FRO6 credit should be coordinated with the public information activities credited as flood response preparations (FRP) under Activity 330 (Outreach Projects), regulations under Activity 430 (Higher Regulatory Standards), and mitigation measures under Activity 530 (Flood Protection).
- Documentation of the annual exercise is a prerequisite Activities 610, 620, and 630. One exercise can meet all three activities' requirement.

620 LEVEES—Summary

Maximum credit: 235 points

622 Elements

- a. **Levee maintenance (LM):** Up to 95 points if the levee system is maintained and operated according to a written maintenance plan. There are no credit points for levees that are accredited by FEMA, although documentation of annual inspection and maintenance is a prerequisite for any credit under this activity.
- b. **Levee failure threat recognition system (LFR):** Up to 30 points for having a system to advise the emergency manager when there is a threat of a levee's failure or overtopping.
- c. **Levee failure warning (LFW):** Up to 50 points for disseminating the warning to the public.
- d. **Levee failure response operations (LFO):** Up to 30 points for response actions to be undertaken to reduce or prevent threats to health, safety, and property.
- e. **Levee failure critical facilities planning (LCF):** Up to 30 points for coordination of actions with operators of critical facilities.

Credit Criteria

Credit criteria for this activity are described in Section 621.b.

- a. Credit is limited to levee systems that were designed and constructed as levee systems and are operated and maintained by a public agency.
- b. The community must submit a map showing the location of each levee and the areas that would be flooded if the levee were to fail or be overtopped.
- c. Annual inspections of the levee system must be conducted according to a written maintenance plan.
- d. The community must implement an outreach project to the residents and businesses in the area(s) that would be inundated if a levee were overtopped.
- e. To receive any Activity 620 credit, the community must receive some LM credit and some credit for LFR, LFW, LFO and LCF, and
 - (1) There must be a levee failure flood warning and response plan that has been adopted by the community's governing body.
 - (2) There must be an annual exercise of the plan and a lessons-learned report.

Each element has additional criteria specific to that element.

Impact Adjustment

The credit for LM, LFR, LFW, and LFO are adjusted based on the number of buildings within the Special Flood Hazard Area affected by each element. There is no impact adjustment for LCF.

Documentation Provided by the Community

Each element has a separate section describing needed documentation.

620 LEVEES

The OBJECTIVE of this activity is to encourage communities to properly inspect and maintain levees and to identify impending levee failures in a timely manner, disseminate warnings to appropriate floodplain occupants, and coordinate emergency response activities to reduce the threat to life and property.

621 Background

The failure or overtopping of a levee poses extreme hazards to buildings, infrastructure, and people on the landward side of the levee.

Flood waters near a levee breach usually move at a much greater velocity than the water within the channel. The combination of high-velocity flows and rapidly rising water makes evacuation and other responses difficult or impossible. Sound emergency response plans for levee failures are critical, especially if evacuation routes would be restricted or severed.

Definition of a Levee

A levee is a structure, usually an earthen embankment, designed and constructed using sound engineering practices, to contain, control, or divert flood waters in accordance with a designated risk reduction level.

See Section 120 (Glossary).

Up to a certain point, a levee usually will prevent flooding to properties on its landward side. However, regardless of the design standard used, levees can and do fail. Someday there will be a flood that exceeds the levee's ability to hold flood waters, and when a levee is overtopped it is far more likely that it will suffer a catastrophic breach or failure as well. Even well-maintained levees can fail for a variety of reasons.

By doing everything possible to reduce the chance of levee failure and by being prepared for an event that could lead to a levee failure, a community can reduce the potential hazards to life, health, and property.

621.a. Activity Description

The maximum credit for Activity 620 is 235 points.

The items credited by this activity include

- Proper maintenance of the levees (credited under LM),
- A system to advise local emergency managers of a potential levee failure or overtopping (credited under LFR),
- A warning system for people on the landward side of the levee (credited under LFW),
- A plan of action to minimize the threat to life and property during the flood (credited under LFO), and
- Coordination with critical facility operators (credited under LCF).

For levee maintenance credit, a community must implement a levee maintenance plan, create and maintain an inventory of levees, identify the vulnerable population and at-risk structures, and conduct an outreach project to advise the vulnerable population.

Levee maintenance (LM) is a prerequisite for the four emergency preparedness and response elements (LFR, LFW, LFO, and LCF), which are based on the community's adopted levee failure warning and response plan. This activity is not intended to be a model for developing a levee failure warning and response plan or program. As with the rest of the Community Rating System (CRS) activities, its objective is to provide a way to measure a local program's potential impact on life safety, health, and property damage. An effective program needs to be carefully prepared and tailored to the local hazards and the specific needs of the community.

621.b. Activity Credit Criteria

Credit for this activity is based on levee systems, i.e., the levee structure plus all appurtenant facilities, such as pump stations, that are needed to control flood waters. To receive credit under this activity,

(1) The levee system(s) for which the community requests credit (or qualification for credit) must have been designed and constructed as a levee (see Section 120 (Glossary)). Structures such as road and railroad embankments that divert flood waters are not considered "levees" for the purposes of this credit unless it can be documented that they were intended to be levees and were designed and constructed accordingly.

(2) The levee system(s) for which the community requests credit (or qualification for credit) must be operated and maintained by a public agency. This could be a federal or state agency, a levee district, an office or department of the community, or other public entity.

(3) The community must submit a map showing the location of each levee and the areas that would be flooded if the levee were to be overtopped or fail and an inventory of the buildings and critical facilities that would be flooded upon overtopping or failure. For each levee, the following information must be submitted:

(a) The approximate protection level of the levee and the expected overtopping elevation, if different. Newer levee systems may include extra levee height to ensure overtopping at a predefined location. Older designs often use freeboard, which may vary along the system;

(b) A map of the levee(s) and the area(s) affected should the levee(s) be overtopped or fail. If there are no detailed levee breach maps or levee failure studies, then the map

Non-Levee Structures

Non-levee structures, such as roads and railroad embankments, pose the same hazards as levees and are more likely to fail.

Communities are urged to mitigate these hazards by paying special attention to emergency preparedness and response for buildings on the landward side of these structures.

would show the area below the expected overtopping elevation. Guidance for this mapping can be found in Section 621.c.

- (c) A list of the addresses of all properties with insurable buildings in the inundated areas. This list is needed for the required outreach project and the impact adjustment (bLF); and
- (d) A list of the critical facilities that would be flooded or otherwise affected by a failure or by the overtopping of the levee (see Section 622.e, LCF1).

This credit criterion is a prerequisite for Class 4 communities.

- (4) The community must have a levee maintenance plan that includes annual inspections and an emergency action plan for the levee system(s), and the plans must meet the credit criteria for LM1 and LM2. There are no CREDIT POINTS for accredited levees or levees owned and operated by the federal agency, but all levees must be documented as meeting the LM1 and LM2 CREDIT CRITERIA in order for the community to receive credit for the rest of the elements in this activity.

- (5) The community must implement one or more outreach projects to the residents and businesses in the area(s) expected to be inundated by a flood that overtops a levee. The project(s) must tell people about their risk of flooding, how they will be warned of a levee-failure flood, the safety measures they should take during a flood (e.g., evacuation procedures and routes), and the benefits of purchasing flood insurance. This can be done by using one or more of the following approaches:

- (a) Sending an outreach project (e.g., a letter, brochure, or newsletter) each year to all properties with insurable buildings in the area(s) subject to a flood that overtops the levee, or

- (b) Developing an appropriate approach as part of a Program for Public Information credited Activity 330 (Outreach Projects).

- (6) The community must obtain some credit in all four levee failure warning and response elements (LFR, LFW, LFO, and LCF) to received credit for its local levee failure and response planning.

Dear Property Owner:

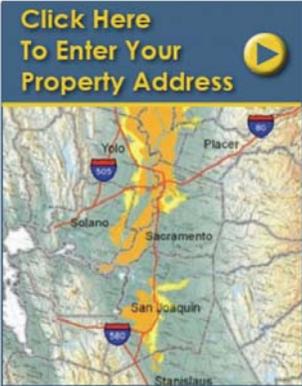
Your property is located behind a State-Federal project levee. According to our records, your property located at _____ may be exposed to potential flood risk from the _____. Your property may also be at risk for flooding from other sources not identified in this notice, such as creeks and local storm drains.

Visit www.water.ca.gov/myfloordrisk and enter your property address to find the areas subject to flooding if State-Federal project levees should fail, and to get information on the condition of the levees.

Be aware of your flood risk and be prepared. Read this notice for important information about purchasing flood insurance, emergency planning, and protecting your property.

Consider these facts:

Click Here To Enter Your Property Address



Excerpt from the annual outreach project sent by the California Department of Water Resources to residents of leveed areas.

- (7) To receive LFR, LFW, LFO, and LCF credit, the community must have a levee failure flood warning and response plan that has been adopted by the community's governing body. The plan should be part of, and must meet the same criteria as, the community's flood warning and response plan described in Section 611.b(4).
- (8) There must be at least one exercise or drill of the levee failure warning and response plan each year. This can be an exercise for a flood, levee failure, dam failure, or hurricane. This criterion can be met if the plan is implemented in response to an actual flood or threat of a levee failure. In either case, there must be an evaluation of the performance of the plan and recommended changes that may be needed, as is usually done in an after-action report.

621.c. Map of the Affected Area

Credit criterion Section 621.(b)(3)(b) calls for a map that is used to identify the area affected should the levee fail or overtop. This map is central to CRS credit for this activity. It can help determine the building inventory (Section 621.(b)(3)(c)), the addresses that get the outreach project (Section 621.b(5)), and the impact adjustment factors (Section 623).

This map is not necessarily the map (or series of maps) the community uses in its flood warning and response plan, which is credited in Sections 622(b)–(d). A community should develop a warning and response plan based on different flood level scenarios, including levee breaks at elevations lower than the overtopping level.

The criteria for an affected area map is the same for levees that have been accredited and those that have not been accredited on a Flood Insurance Rate Map. There are two ways the map can be prepared:

- (1) If the community or levee agency has an engineering study that identified the area affected by a levee breach or overtopping, that map can be used. Note that such studies often have more than one scenario. The total area flooded by all the scenarios should be used for the affected-area map.
- (2) In the absence of an engineering study on areas that would be flooded by a levee failure or levee overtopping, the affected area is all land below the elevation of the top of the levee. Figure 620-1 identifies such an area where the top of the levee is

Annual Warning and Response Exercise

Activities 610 (Flood Warning and Response), 620 (Levees), and 630 (Dams) require an annual exercise or drill of the warning and response plan. A flood, levee failure, dam failure, or hurricane exercise qualifies as an exercise for all three activities.

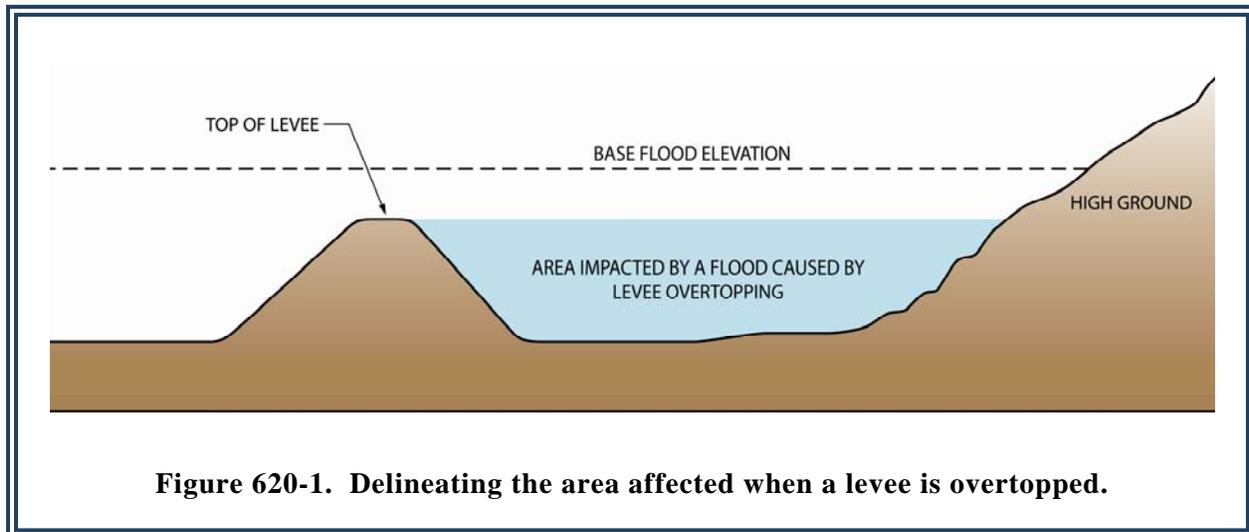
An evaluation of the performance of the warning and response plan must include

- A description of the exercise;
- An evaluation of the
 - Threat recognition procedures,
 - Warning dissemination, and
 - Response operations; and
- Recommended changes to the plan.

The exercise requirement can also be met if the community responds to an actual flood or an actual threat of a levee or dam failure, provided that the items listed above are discussed in an after-action (or similar) report.

lower than the base flood elevation. Where the top of the levee is higher than the base flood elevation, the same approach is used and the affected area would be larger than the Special Flood Hazard Area.

Note that communities that have levee breach analyses are encouraged to use the larger levee overtopping area to determine the addresses for the outreach project. It is a safer standard to use for identifying the properties potentially affected by a worst case/deepest flooding situation.



622 Elements

622.a. Levee maintenance (LM)

The maximum credit for this element is 95 points.

LM credit is provided for the levee system's maintenance program and emergency action plans.

A levee system (the levee structure plus all appurtenant facilities) is only as good as its weakest part. An operations and maintenance plan needs to include an inspection process that identifies openings or potential weak points in the levee. Equipment to close these openings needs to be checked and tested and instructions that define roles and responsibilities need to be put in place before the levee is threatened by a flood. All of these items are vital to good maintenance and are credited in this element.

LM credit is provided in two ways:

- (1) LM1 credit is provided for the annual inspection and maintenance of the levee system to identify and correct problems as required in a maintenance plan; and

- (2) LM2 credit is provided for the levee agency’s emergency action plan. This credit is for having a written operations plan or manual that describes what must be done when a flood occurs by the agency that owns the levee. The plan may be in the same document as the LM1 maintenance plan.

Levees that are accredited by the Federal Emergency Management Agency (FEMA) for mapping purposes are not eligible for CREDIT POINTS under LM, because they already are required to have an adequate maintenance program as a condition of accreditation. There are no LM credit points for a levee owned or operated by a federal agency. However, communities can receive credit points for their levee failure warning and response plans (LFR, LFW, LFO, and LCF credit) for the areas protected by accredited or federally owned or operated levees.

To receive credit points for a levee failure warning and response plan, the levee must be shown to “qualify” for LM credit. All levees must “qualify,” but the credit points for LM are limited to non-accredited and non-federal levees.

Credit Criteria

- (1) The activity credit criteria in Section 621.b must be met.
- (2) The community must qualify for some LM1 and LM2 credit to receive any LM credit or to qualify for any Activity 620 credit.
- (3) To qualify for LM1 credit, the levee system maintenance must
 - (a) Ensure that the levee system’s stability, height, and overall integrity are maintained. Encroachments must be controlled to ensure that they do not compromise the levee’s integrity, hinder operations and maintenance, and/or diminish the ability to engage in flood fighting activities. Maintenance programs must correct problems posed by existing encroachments.
 - (b) Provide written operations and maintenance procedures that include
 - (1) Annual inspections of the condition of the levee system (i.e., the levee structure, pump stations, closure devices, etc.);
 - (2) The maintenance activities to be performed;
 - (3) The frequency of their performance; and
 - (4) The person responsible for their performance (by name or title).

Emergency Action Plans and Levee Failure Warning and Response Plans

A levee EMERGENCY ACTION PLAN is prepared and implemented by the LEVEE OWNER OR OPERATOR. It includes actions such as closing openings and patrolling for problems along the levee. It may have another name, such as a levee operations plan.

A LEVEE FAILURE WARNING AND RESPONSE PLAN is prepared and implemented by the LOCAL EMERGENCY MANAGEMENT AGENCY. It specifies actions to take to protect people and property in the flood-prone area, such as ordering an evacuation.

- (c) Perform and document annual inspections and needed maintenance of levees and floodwalls, as well as pumps, interior drainage systems, closures, penetrations, and transitions that provide for system integrity.
- (4) To qualify for LM2 credit, the emergency action plan must have a written operations plan or manual that describes what must be done by the agency that owns the levee when a flood occurs. It must include
 - (a) A list of all actions that need to be taken at different flood levels, including
 - (1) Procedures to notify the local emergency managers of a potential problem,
 - (2) All openings and closures that need to be closed and the location of the equipment and materials to effect the closure, and
 - (3) Periodic patrols of the levee to detect problems such as erosion and seepage;
 - (b) The person or office responsible for their performance (by name or title);
 - (c) Annual inspections of all equipment and material needed for the plan, such as vehicles and stockpiled sandbags; and
 - (d) Annual tests of all closures, pumps, and other equipment needed to implement the emergency action plan. Any equipment that is used routinely throughout the year, such as vehicles and drainage pumps, do not need testing records for CRS credit.

The plan may be in the same document as the LM1 maintenance plan.

- (5) The community's levee maintenance program must be compliant with applicable federal environmental and historic preservation laws and executive orders (see Section 507). The community and/or levee owners must complete CC-620EHP, Certification of Compliance with Environmental and Historic Preservation Requirements for Levee Maintenance, which can be found in Appendix F. Credit is not provided if levee maintenance procedures are not compliant with applicable federal laws and executive orders.

Environmental Protection and Historic Preservation

Because it is a FEMA program, the CRS must ensure that activities for which it provides credit are compliant with applicable federal environmental and historic preservation laws and executive orders. Section 507 expands on this requirement and presents a summary of FEMA's policy. Figure 500-5 lists the federal programs that should be considered during project development.

Credit Points

LM = the sum of the following

LM1 = 50 points, for the levee system maintenance plans

LM2 = 45 points, for the levee system emergency action plans

Impact Adjustment

The impact adjustment for the activity is described in Section 623.

Documentation Provided by the Community

(1) At each verification visit,

- (a) The needed documentation for this activity is assembled by the ISO/CRS Specialist and provided to the technical reviewer. There is a checklist to help the emergency manager identify all needed documentation (available at www.CRSresources.org).
- (b) The map and inventory of buildings described in credit criterion (3) in Section 621.b.
- (c) The LM1 maintenance procedures described in credit criterion (3)(b) in Section 622.a, or documentation that the procedures have been approved by FEMA as meeting PM 63 requirements or approved by the U.S. Army Corps of Engineers.
- (d) The LM2 emergency action plan described in credit criterion (4) in Section 622.a, or documentation the plan has been approved by FEMA as meeting PM 63 requirements or approved by the Corps of Engineers.
- (e) Completed Community Certifications of Compliance with Environmental and Historic Preservation Requirements for Levee Maintenance (CC-620EHP) from all levee owners, which can be found in Appendix F.

(2) At each verification visit and with the annual recertification,

- (a) Documentation that all levees to be credited have been inspected during the previous year and are being maintained in accordance with the procedures and standards of the LM1 maintenance plan (credit criterion (3)(c) in Section 622.a).
- (b) Records showing the most recent annual inspection of all equipment and material needed for the LM2 emergency action plan (credit criterion (4)(c) in Section 622.a).
- (c) Records showing the most recent annual test of all closures, pumps, and other equipment needed to implement the LM2 emergency action plan (credit criterion (4)(d) in Section 622.a).
- (d) A copy of the outreach materials used to advise people of the levee failure hazard and ways to protect themselves from flooding (credit criterion (5) in Section 621.b). If the outreach material is also credited under Activity 330 (Outreach Projects), a

separate submittal is not needed, provided that the other document (including a PPI, if used) is annotated to show where the Activity 620 outreach topics are covered.

622.b. Levee failure threat recognition system (LFR)

The maximum credit for this element is 30 points.

LFR credit is provided for monitoring flood conditions near the levee. LFR credit is separate from flood threat recognition credit in Activity 610 (FTR), but the levee failure threat recognition system should be closely coordinated with the FTR system.

The more lead time that a community has, the more that can be done to reduce hazards associated with a flood. Although a levee may fail suddenly, overtopping is more predictable. There may be some advance indications of a potential levee failure, such as seepage and sand boils. Therefore, there are two key aspects of a levee failure threat recognition system that would provide the early notification needed by emergency managers to issue timely warnings and implement their flood response operations.

- (1) Monitoring flood conditions (LFR1): When flood levels reach (or are predicted to reach) certain heights, specific actions should be initiated, such as mobilizing patrols or opening the emergency operations center.
- (2) Monitoring levee conditions (LFR2): This is done with patrols (on the ground or from the air) and checking known problem sites during a flood.

Credit Criteria

- (1) The activity credit criteria in Section 621.b must be met.
- (2) The threat recognition procedures must be in the levee failure warning and response plan or a related document (credit criterion (7) in Section 621.b).
- (3) To receive LFR credit, some credit points must be obtained under both LFR1 and LFR2.
- (4) For monitoring flood conditions and LFR1 credit:
 - (a) The community and the levee owner must have a flood threat recognition system that monitors conditions. This would be a system that provides early notification of rising waters that may threaten the levee's integrity. The system must meet the credit criteria of FTR in Activity 610 (Flood Warning and Response). A National Weather Service flood potential outlook or flood watch would also be sufficient.
 - (b) Additional credit is provided for redundant or backup monitoring systems along a levee that send a signal to the emergency manager if water is rising on the landward side of the levee. This system could use automated flood alarms or automated flood warning systems, or it could rely on trained spotters.
 - (c) The equipment used for the flood monitoring must be tested at least annually. For CRS credit, testing records are not needed for equipment that is used routinely throughout the year, such as radios and vehicles.

-
- (5) For LFR2 credit, the community and/or the levee owner must initiate the monitoring of levee conditions when certain, pre-defined flood conditions are present, and
- (a) The monitoring procedures must cover
 - Levee patrol staffing and assigned sections of the levee system,
 - How and when the patrol teams are activated,
 - What the patrols are to look for in the different sections,
 - Methods and frequency for reporting, and
 - How the community's emergency managers are kept posted on the situation.
 - (b) The procedures for monitoring levee conditions must be exercised at least once each year, in accordance with credit criterion (8) in Section 621.b.

Credit Points

LFR = the total of LFR1 and LFR2, up to the maximum of 30 points

LFR1 = the sum of

- (a) 10 points, for monitoring flood conditions, and
- (b) 5 points, for monitoring flood conditions along the levee

LFR2 = up to 15 points, for monitoring levee conditions

Impact Adjustment

The impact adjustment for the activity is described in Section 623.

Documentation Provided by the Community

- (1) At each verification visit,
 - (a) The levee failure warning and response plan or related document that describes the threat recognition procedures (credit criterion (2) in Section 622.b) and credit criterion (7) in Section 621.b. The plan or related document must be marked to show where the credited items appear.
 - (b) An impact adjustment map showing the area(s) affected by each element and documentation showing how the numbers of buildings used in the calculations were determined (credit criteria (3)(b) and (3)(c) in Section 621.b and Section 623 impact adjustment).
- (2) At each verification visit and with the annual recertification,
 - (a) Records showing the most recent annual test of all equipment and material needed for the system (credit criterion (4)(c) in Section 622.b).

- (b) A description of the exercise, drill, or response to an actual emergency or disaster conducted during the previous year (credit criterion (8) in Section 621.b). The exercise must include the procedures for monitoring levee conditions, if they are credited.

622.c. Levee failure warning (LFW)

The maximum credit for this element is 50 points.

LFW credit is provided for disseminating warnings of a potential levee failure to the public. The warning program for LFW credit should be closely coordinated with the flood warning dissemination activities credited in Section 612.b (EWD).

Once the levee failure flood threat recognition system tells local emergency managers what will be flooded and when, warnings should be issued to the affected populations. The messages that need to be conveyed and the timing for delivering them should be thought out in advance, as part of the levee failure warning and response plan.

The messages should state when flooding is predicted to occur, its expected severity, and appropriate response actions (e.g., evacuation routes, safe shelters, protective actions). The messages should be drafted in coordination with the messages and projects credited under flood response preparations (FRP) under Activity 330 (Outreach Projects).

Special warning arrangements for schools, nursing homes, and other critical facilities are also credited under LCF.

Credit Criteria

- (1) The activity credit criteria in Section 621.b must be met.
- (2) The warning procedures must be included the levee failure warning and response plan or a related document (credit criterion (7) in Section 621.b).
- (3) The warning must reach people in a timely manner, especially because there may not be much lead time between a sudden levee failure and the moment when water reaches homes and businesses. For example, television or radio announcements are not credited if they are the only approach used because the failure may occur during the night.
- (4) For those warning systems requiring specialized equipment, such as sirens, the equipment and procedures must be tested at least annually. Equipment that is used routinely throughout the year, such as television notices and message boards, does not need testing records for CRS credit.

Credit Points

LFW = the total of the following, up to the maximum of 50 points

LFW1 = 5 points, if the plan includes pre-scripted messages and guidance for staff to quickly issue appropriate warnings keyed to specific triggers, such as when the river reaches a certain level, or when sand boils appear

LFW2 = 5 points, if the public messages include information on the expected elevation of the flood waters and instructions on when to evacuate

LFW3 = 10 points if an outdoor voice-sound system or fixed siren system is used

LFW 4 = EITHER

(a) 2 points if the plan identifies the primary and support agencies responsible for door-to-door or mobile public address warning, OR

(b) 10 points, if the plan identifies the routes, procedures, staff, and equipment necessary for door-to-door or mobile public address warning

LFW 5 = 10 points, if the Emergency Alert System through all channels/stations with pre-scripted draft messages is used

LFW 6 = 10 points, if telephone warnings to residents and businesses are used

LFW 7 = 10 points, if all schools, hospitals, nursing homes, prisons, and similar facilities that need flood warning have NOAA Weather Radio receivers and at least one other automated backup system for receiving flood warnings, provided that the community has coordinated with NOAA and there are arrangements for issuing warnings about levee failures

Impact Adjustment

The impact adjustment for the activity is described in Section 623.

Documentation Provided by the Community

(1) At each verification visit,

(a) The levee failure warning and response plan or related document that describes the emergency warning procedures (credit criterion (2) in Section 622.c and credit

criterion (7) in Section 621.b). The plan or related document must be marked to show where the credited items appear.

- (2) At each verification visit and with the annual recertification,
 - (a) Records showing the most recent annual test of all equipment and material needed for the system (credit criterion (4) in Section 622.c).
 - (b) A description of the exercise, drill, or response to an actual emergency or disaster conducted during the previous year (credit criterion (8) in Section 621.b). The exercise must include the procedures for warning people credited under this element.

622.d. Levee failure response operations (LFO)

The maximum credit for this element is 30 points.

LFO credit is provided for the development of levee failure response operations that identify flood response scenarios, responsibilities, special need populations, and necessary resources. The operations should be closely coordinated with the flood response operations credited in Section 611.c (FRO).

Levee failure response operations need to be spelled out in the levee failure warning and response plan. They include appropriate actions to be implemented when flooding due to the levee failure threatens or actually occurs. The actions are conducted by the community and other cooperating agencies and organizations.

Developing scenarios can help this process. Scenarios are produced by thinking through what will happen in the community if a levee fails or is overtopped. For example, where will the water go? who will get flooded? who will lose access because of high water? and which critical facilities will be affected? These sorts of questions, and the scenarios developed by thinking about them, help with the design of the response operations to minimize the threats to life and property at those flood levels.

Two types of operations should be in the plan.

- (1) Levee protection operations: These are actions taken to prevent or limit a levee's failure due to flood waters and/or from overtopping. The levee agency is usually the lead on levee protection operations, but the community likely will need to provide resources and support. These actions are often called "flood fighting" and can include
 - Sandbagging the top of the levee,
 - Sandbagging and other measures to restrict sand boils, and
 - Measures taken to limit erosion on the toe of the levee.
- (2) Community protection operations: These are actions to minimize the loss of life and property damage in the area flooded when the levee fails or is overtopped. They should be similar to, and even a part of, the flood response operations credited in Section 612.c (FRO). They can include

- Ordering an evacuation of the threatened area,
- Controlling traffic in and out of the flooded area, and
- Opening evacuation shelters.

Credit Criteria

- (1) The activity credit criteria in Section 621.b must be met.
- (2) The levee failure response operations actions must be in the levee failure warning and response plan or a related document (credit criterion (7) in Section 621.b).
- (3) Levee protection operations actions must be closely coordinated with the levee emergency action plan credited under Section 622.a (LM2).
- (4) Credit is based on the extent and level of detail that the levee failure warning and response plan provides for the response operations. General statements or an assignment of responsibilities with no specifics about what is done are not credited. For full credit for LFO, the plan needs to
 - (a) Describe the actions to be taken,
 - (b) Identify the office or official responsible for the action,
 - (c) Define the time needed to carry out the activity, and
 - (d) Contain other critical information that designated agencies and organizations need in order to perform their assigned responsibilities.
- (5) LFO4 credit is provided if there is a list of the personnel, equipment, facilities, supplies, and other resources needed to complete each task. For full credit, the list must identify what is available within the community and what is needed from private suppliers or other jurisdictions.

The National Incident Management System (NIMS 2007) requires local governments to validate the inventory of response assets using FEMA Resources Typing Standards. Department heads and other emergency response team members should know what kinds of resources they have available. This should be compared with the resources needed. Shortfalls may require negotiating agreements with private suppliers or other jurisdictions.

Credit Points

LFO = the total of the following, up to the maximum of 30 points

LFO1 = 10 points, if the community has developed scenarios that review what could happen if the levee were to fail or be overtopped by a flood

LFO2 = 10 points, if the plan identifies response tasks and responsible community staff and other public and private organizations with responsibilities related to the response tasks in the plan

LFO3 = 5 points, for maintaining a data base of people with special needs who require evacuation assistance when a levee failure warning is issued and for having a plan to provide transportation to secure locations

LFO4 = the sum of the following:

- (a) 5 points, if the plan includes a summary of estimated staff, equipment, supplies, and time required for each response task, and
 - (b) 5 points, for identification of the sources of necessary resources
-

Impact Adjustment

The impact adjustment for the activity is described in Section 623.

Documentation Provided by the Community

(1) At each verification visit,

- (a) The levee failure warning and response plan or related document that describes the operations and actions credited above (credit criterion (2) in Section 622.d) and credit criterion (7) in Section 621.b). The plan or related document must be marked to show where the credited items appear.

(2) At each verification visit and with the annual recertification,

- (a) A description of the exercise, drill, or response to an actual emergency or disaster conducted during the previous year (credit criterion (8) in Section 621.b). The exercise must include the actions credited under this element.

622.e. Levee failure critical facilities planning (LCF)

The maximum credit for this element is 30 points.

LCF credit and planning should be closely tied to the critical facilities coordination done under Section 612.d (CFP).

LCF1 credit is provided for having information in the community's levee failure response plan about all critical facilities that could be affected by a levee failure. In general, facilities not subject to flooding during a levee failure do not need to be addressed, although in some cases loss of access can cause a critical situation. There may also be facilities in flood-free sites that are needed to support the flood response effort.

Additional credit is provided in LCF2 if levee failure warning and response plans for individual critical facilities have been developed, reviewed, or accepted by the community.

Credit Criteria

- (1) The activity credit criteria in Section 621.b must be met.
- (2) LCF1 is a prerequisite for any LCF credit.
- (3) For LCF1 credit, the community's levee failure response plan must list the facilities considered critical in a levee failure emergency. The community must contact the facilities to determine whether they need any special warning arrangements. The community does not need to provide a special warning to all critical facilities, only to those identified in the levee warning and response plan as needing one.

There is no impact adjustment for LCF1. The community must include all critical facilities affected by a levee failure on its list.

- (4) For LCF2 credit, levee failure warning and response plans must have been developed, reviewed, or accepted by the community for individual critical facilities.

Credit Points

LCF = the total of the following

LCF1 = up to 15 points, if the adopted plan includes

- (a) a list of the facilities considered critical in a levee failure emergency
- (b) the names and phone numbers of the operators of all public and private critical facilities affected by levee failure
- (c) arrangements for issuing special warnings or early notifications directly to those critical facilities that need advance warning

LCF2 = up to 15 points, if critical facilities listed under LCF1 have their own levee failure response plans that have been developed, reviewed, or accepted by the community. The credit is prorated based on the percentage of affected critical facilities that have creditable plans

Impact Adjustment

There is no impact adjustment for LCF.

Documentation Provided by the Community

- (1) At each verification visit,
- (a) A list of all public and private critical facilities that would be affected by levee failure or that would need to be operational during a levee-failure flood.
 - (b) Contact information (names and phone numbers) of the operators of the facilities on the above ((1)(a)) list.
 - (c) The above ((1)(a)) list of critical facilities, marked to identify those needing special warning or advance notification.
 - (d) [For LCF2 credit] The above ((1)(a)) list of critical facilities, marked to identify those that have developed their own flood warning and response plans that have been reviewed and accepted by the community. The ISO/CRS Specialist will ask for samples of the plans for review.
- (2) With the annual CRS recertification,
- (a) A page from the latest list of the critical facilities provided for LCF1, which must be updated at least annually.

623 Impact Adjustment

There is no impact adjustment for LCF. The community must include all critical facilities affected by a levee failure on its list.

The credit points for LM, LFR, LFW, and LFO are adjusted based on the number of buildings affected by the element. Determining these adjustments requires identifying the area affected and then counting the buildings within that area. Identifying the affected area is described in Section 621.c, Map of the Affected Area.

Counting buildings for an impact adjustment is discussed in Section 302.

$$(1) r_{LM} = \frac{b_{LM}}{b_{LF}}$$

$$(2) r_{LFR} = \frac{b_{LFR}}{b_{LF}}$$

$$(3) r_{LFW} = \frac{b_{LFW}}{b_{LF}}$$

$$(4) r_{LFO} = \frac{b_{LFO}}{b_{LF}}, \text{ where}$$

b_{LM} = the number of buildings in the area affected by a flood resulting from a failure of the levee being maintained,

bLFR = the number of buildings that benefit from the levee failure threat recognition system,

bLFW = the number of buildings that benefit from the levee failure flood warnings,

bLFO = the number of buildings in the area covered by the levee failure response operations actions, and

bLF = the total number of buildings in the community affected by levee failure as shown on the affected-area map (Section 621.c)

bLFO cannot be greater than bLFW
 bLFW cannot be greater than bLFR
 bLFR cannot be greater than bLM
 rLM cannot be greater than 1.0

624 Credit Calculation

$$c620 = (LM \times rLM) + (LFR \times rLFR) + (LFW \times rLFW) + (LFO \times rLFO) + LCF1 + LCF2$$

625 For More Information

- a. Additional information, reference materials, and examples can be found at www.CRSresources.org/600.
- b. Levee mapping and public information materials are available on FEMA's website, <http://www.fema.gov/living-levees-its-shared-responsibility>.
- c. Each district of the Corps of Engineers has expertise in levee construction, maintenance, and flood fighting. See www.usace.army.mil/Locations.aspx.
- d. The California Department of Water Resources has special programs for leveed areas in the Central Valley, including a flood risk notice that would qualify for the outreach project prerequisite for this activity. www.water.ca.gov/myfloodrisk.
- e. The American Society of Civil Engineers (ASCE) has a booklet for residents in leveed areas, "So, You Live Behind a Levee!" it is available at <http://content.asce.org/files/pdf/SoYouLiveBehindLevee.pdf>.

626 Related Activities under the Community Rating System

- A community that develops an appropriate approach to the outreach to residents required in Section 621.b(5) as part of a Program for Public Information can be credited under Activity 330.
- LFR is similar to element FTR under Activity 610 and to element DFR under Activity 630. It credits a system that provides the community with the earliest possible notification that a flood is imminent. The three threat recognition systems should be closely coordinated.
- LFW is similar to element EWD under Activity 610 and element DFW under Activity 630. It credits a flood warning dissemination system that provides a critical linkage between the recognition of an impending flood and the community's response to the emergency. The three warning dissemination systems should be closely coordinated.
- LFO is similar to element FRO under Activity 610 and element DFO under Activity 630. It identifies opportunities to prevent loss of life and property damage during a flood. The three response operations plans should be closely coordinated.
- LCF is similar to credits under Activity 610 and 630 because it requires the maintenance of a current list of critical facilities in potential levee inundation areas, the maintenance of up-to-date contact information for each critical facility, and having plans for warning each critical facility in a timely manner.
- Documentation of the annual exercise is a prerequisite for Activities 610, 620, and 630. One exercise can meet the requirements for all three activities.

630 DAMS—Summary

Maximum credit: 160 points

632 Elements

- a. **State dam safety program (SDS):** Up to 45 points based on the credit for the state's program.
- b. **Dam failure threat recognition system (DFR):** Up to 30 points for having a system to advise the emergency manager when there is a threat of a dam failure.
- c. **Dam failure warning (DFW):** Up to 35 points for disseminating the warning to the public.
- d. **Dam failure response operations (DFO):** Up to 30 points for planning and practicing specific tasks to be undertaken to reduce or prevent threats to health, safety, and property.
- e. **Dam failure critical facilities planning (DCF):** Up to 20 points for coordination of dam failure warning and response activities with operators of critical facilities.

Credit Criteria

Overall criteria for this activity are described in Section 631.b.

- a. There must be at least one insurable building within the community that is subject to inundation from the failure of a high-hazard-potential dam.
- b. The community must have a description of the dam failure threat and a dam failure inundation map.
- c. To receive any Activity 630 credit, the community must receive some credit for DFR, DFW, DFO, and DCF.
- d. There must be an adopted dam failure warning and response plan.
- e. There must be one or more outreach projects on the warning and safety precautions.
- f. There must be an annual exercise of the plan with a lessons-learned report.

Each element has additional criteria specific to that element.

Impact Adjustment

There is no impact adjustment for the state dam safety program (SDS). The credit for DFR, DFW, and DFO is adjusted based on the number of buildings in the community that would be affected by the failure of a high-hazard-potential dam. There is no impact adjustment for DCF.

Documentation Provided by the Community

Each element has a separate section describing needed documentation.

630 DAMS

The OBJECTIVES of this activity are to encourage states to provide dam safety information to communities and to encourage communities, in turn, to provide timely identification of an impending dam failure, disseminate warnings to those who may be affected, and coordinate emergency response activities to reduce the threat to life and property.

631 Background

The legal definition of a “dam” for regulatory purposes varies from state to state. A dam may be as low as 5 feet, with an impoundment of no more than 5 acre-feet of water, or it may be 100 feet high, creating a recreational reservoir. For the purposes of this activity, a “dam” is a structure regulated by the state’s dam safety office. This activity focuses less on the dam structure itself than on the impact of a flood that would result from a breach or failure of that structure.

Unlike levees, dams do not need flood conditions to fail. They can be breached with little or no warning and send a wall of water downstream. The combination of high velocity, great depth, and short notice has proven particularly deadly and destructive. The most-recognized way to minimize the dam failure hazard is to enforce dam construction and maintenance standards, usually through a state dam safety program.

In addition to dam failures, normal operations of dams may cause unusual flooding situations downstream. Dams normally have operations plans to deal with unusual circumstances, including excessive runoff into the dam and the occasional need to lower the reservoir level.

Because of the threat of flooding from dam failure or dam operations, the Community Rating System (CRS) credits cooperation among state dam safety officials, dam owners and operators, and local emergency managers. Credit is for state and local dam safety programs that

- Help make the needed information available,
- Improve communications among operators of the dams and downstream communities, and
- Develop warning and response plans for dam failures.

The credit is keyed to addressing the areas at risk from the failure of a high-hazard-potential dam. A “high-hazard-potential dam” is one for which failure or operational errors will probably cause loss of human life downstream. Communities must contact their state dam safety office to determine if they are affected by such a dam.

Communities are encouraged to address other dams whose failure could cause loss of life or property damage.

This activity is not intended to be a model for developing a dam failure warning and response plan program. As with the rest of the CRS activities, its objective is to provide a simple way to measure a local program's potential impact on life safety, health, and property damage. An effective program needs to be carefully prepared and tailored to the local hazards and the specific needs of the community.

631.a. Activity Description

The maximum credit for Activity 630 is 160 points.

This activity provides credit to communities that would be affected by the failure of an upstream high-hazard-potential dam. Credit is provided under five elements:

- The state's dam safety program that sets construction, maintenance, and data provision standards for dams (credited under SDS),
- A system to advise local emergency managers of a potential dam failure (credited under DFR),
- A warning system for the areas downstream of the dam (credited under DFW),
- A plan of action to minimize the threat to life and property during the flood (credited under DFO), and
- Coordination with critical facility operators (credited under DCF).

631.b. Activity Credit Criteria

These activity credit criteria apply to all Activity 630 elements except SDS (Section 632.a).

- (1) There must be at least one insurable building within the community subject to inundation due to the failure of a high-hazard-potential dam.
- (2) The community must submit a description of the dam failure threat, including the following for each high-hazard-potential dam that affects the community. The first three items should be available from the state's dam safety office. If they are not available from the state or the owner of the dam, the community may have to develop the information and document it.
 - (a) A general description of the dam, including its distance upstream from the community;
 - (b) A dam failure inundation map;
 - (c) Dam failure flood hazard data, including the arrival time of flood waters at different locations and peak elevations of the dam failure flood;
 - (d) The development exposed to dam failure flooding, such as the number and types of buildings; land use (residential, agricultural, open space, etc.); and critical facilities; and

- (e) The expected impacts of dam failure flooding on health and safety; community functions, such as police and utility services; and the potential for secondary hazards.

Local governments may have completed a risk assessment that meets this criterion as part of their floodplain management or hazard mitigation plan credited under Activity 510. If not, the community can complete the CRS Community Self Assessment described in Section 240 of the *CRS Coordinator's Manual*. The products from either of these efforts should provide the basis for the dam failure flood hazard description.

This credit criterion is a prerequisite for Class 4 communities.

- (3) The community must obtain some credit in all four dam failure warning and response elements (DFR, DFW, DFO, and DCF) in order to receive any credit for its local dam failure warning and response planning.
- (4) To receive DFR, DFW, DFO, and DCF credit, the community must have a dam failure warning and response plan that has been adopted by the community's governing body. The plan should be part of, and must meet the same criteria as, the community's flood warning and response plan described in Section 611.b(4).
- (5) To receive DFR, DFW, DFO, and DCF credit, the community must implement one or more outreach projects to the residents and businesses in the area(s) expected to be inundated by a dam failure. The project(s) must tell people of their risk of flooding, how they will be warned of a dam failure flood, and the safety measures they should take during a flood (e.g., evacuation procedures and routes). This can be done by using one or more of the following approaches:
- (a) Sending an outreach project (e.g., a brochure, letter, or newsletter) each year to all residents and businesses in the community;
 - (b) Sending an outreach project each year to all residents and businesses in the area(s) subject to dam failure flooding; or
 - (c) Developing an appropriate approach as part of a Program for Public Information credited under Activity 330 (Outreach Projects).

Annual Warning and Response Exercise

Activities 610 (Flood Warning and Response), 620 (Levees), and 630 (Dams) require an annual exercise or drill of the warning and response plan. A flood, levee failure, dam failure, or hurricane exercise qualifies as an exercise for all three activities.

An evaluation of the performance of the warning and response plan must include

- A description of the exercise,
- An evaluation of the
 - Threat recognition procedures,
 - Warning dissemination,
 - Response operations, and
- Recommended changes to the plan.

The exercise requirement can also be met if the community responds to an actual flood or actual threat of a levee or dam failure, provided that the items listed above are discussed in an after-action (or similar) report.

- (6) To receive DFR, DFW, DFO, and DCF credit, there must be at least one exercise or drill of the dam failure warning and response plan each year. This can be an exercise for a flood, levee failure, dam failure, or hurricane. This criterion would be met if the plan is implemented in response to an actual flood or actual threat of a dam failure. In either case, there must be an evaluation of the performance of the plan and recommended changes that may be needed, as is usually done in an after-action report.

632 Elements

632.a. State dam safety program (SDS)

The maximum credit for this element is 45 points.

SDS credit is provided for the state's dam safety program to a community that would be affected by the failure of an upstream high-hazard-potential dam. Credit is based on

- The assessment of the condition of dams in the state,
- Risk communication and public awareness, and
- Promotion of emergency action plans by operators of the dams.

All of these are designed to encourage states to provide needed flood threat data to communities and to encourage operators of the dams to cooperate with local emergency management planning.

Credit Criteria

- (1) The SDS credit earned by the state dam safety office is provided to all communities that would be affected by a flood from the failure of a high-hazard-potential dam. This must be documented with a description and a map.
- (2) The community must meet state dam safety standards to receive credit for this element. If the community owns or regulates the construction, operation, or maintenance of any dams, the community's dams and/or its dam safety program must meet the state standards for dam safety.
- (3) If the state's SDS credit changes, the community's credit for SDS will be updated at the next verification visit or modification.

Credit Points

SDS = up to 45 points for communities affected by high-hazard-potential dams

Impact Adjustment

There is no impact adjustment for SDS.

Documentation Provided by the Community

(1) At each verification visit,

- (a) The needed documentation is assembled by the ISO/CRS Specialist and provided to the technical reviewer for this activity. There is a checklist to help the emergency manager identify all needed documentation, available at www.CRSresources.org/600.
- (b) A map and description of the threat from failure of high-hazard-potential dams (credit criterion (2) in Section 631.b).

632.b. Dam failure threat recognition system (DFR)

The maximum credit for this element is 30 points.

DFR credit is provided for primary and secondary threat recognition procedures. This credit is separate from flood threat recognition credit in Activity 610 (FTR), but the dam failure threat recognition system should be closely coordinated with the FTR system.

The more lead time that a community has, the more that can be done to protect people from a flood. Although a dam may be breached suddenly, the flood waters may not reach the community for some time. This credit is for a system that advises the community if a breach is likely or is occurring, giving the community and residents time to respond.

- (1) Primary dam failure threat recognition (DFR1): Credit is provided for primary threat recognition procedures in which the operator of the dam notifies local emergency managers of a potential or actual dam breach. This could be based on a predetermined reservoir level, water flowing over the spillway, structural problems discovered in the dam, or other cause for alarm.
- (2) Secondary dam failure threat recognition (DFR2): Additional credit is provided for a backup system that includes sensors or cameras on the dam and/or a gage, camera, or other river-level monitoring system located between the dam and the community. This information must be directly available to the emergency manager.

Credit Criteria

(1) The activity credit criteria in Section 631.b must be met.

(2) For DFR1 and DFR2:

- (a) The threat recognition procedures must be in the dam failure warning and response plan or a related document (credit criterion (4) in Section 631.b).
- (b) The threat recognition system must be monitored by the operator and/or the local emergency manager (or office on behalf of the emergency manager) 24 hours a day, seven days a week.

-
- (c) The equipment used must be tested at least quarterly. Equipment that is used routinely throughout the year, such as a telephone, does not need testing records for CRS credit.
- (3) DFR1 credit is a prerequisite for DFR2 credit.
 - (4) For DFR1 credit, the primary dam failure threat recognition procedures must include
 - (a) Procedures and predetermined conditions for when the operator of the dam notifies local emergency managers of a potential or actual dam breach; and
 - (b) At least quarterly communication checks between the operator of the dam and emergency services officials.
 - (5) For DFR2 credit, the secondary dam failure threat recognition backup system must be directly available to the emergency manager.

Credit Points

DFR = the total of the following, up to the maximum of 30 points

DFR1 = up to 20 points, for the primary dam failure threat recognition system

DFR2 = up to 10 points, for the secondary dam failure threat recognition system

Impact Adjustment

The impact adjustment for the activity is described in Section 633.

Documentation Provided by the Community

- (1) At each verification visit,
 - (a) The dam failure warning and response plan or related document that describes the threat recognition procedures (credit criterion (2)(a) in Section 632.b and credit criterion (4) in Section 631.b). The plan must be marked to show where the credited items appear.
 - (b) An impact adjustment map showing the area(s) affected by each element and documentation showing how the numbers of buildings used in the calculations were determined (credit criteria (2)(b) and (2)(d) in Section 631.b and Section 633 impact adjustment).

- (2) At each verification visit and with the annual recertification,
 - (a) Records of the quarterly test of all equipment and material needed for the system (credit criterion (2)(c) in Section 632.b) and the quarterly communication checks between the operator of the dam and emergency services officials (credit criterion (3)(b) in Section 632.b).
 - (b) A copy of the outreach material used to advise people of the dam failure hazard and of ways to protect themselves from flooding (credit criterion (5) in Section 631.b). If the outreach material is also credited under Activity 330 (Outreach Projects), a separate submittal is not needed provided the other document (including a PPI, if used) is annotated to show where the 630 outreach topics are covered.
 - (c) A description of the exercise, drill, or response to an actual emergency or disaster conducted during the previous year (credit criterion (6) in Section 631.b). The exercise must include the dam failure threat recognition procedures.

632.c. Dam failure warning (DFW)

The maximum credit for this element is 35 points.

DFW credit is provided for disseminating the warning of a potential dam failure to the public through messages and other notification systems. This warning program for DFW credit should be closely coordinated with the flood warning dissemination activities credited in Section 612.b (EWD).

Once the dam failure flood threat recognition system tells local emergency managers what will be flooded and when, warnings should be issued to the affected populations. The messages that need to be conveyed and the time at which they should be delivered should be thought out in advance, as part of the dam failure warning and response plan.

The messages should state when flooding is predicted to occur, its expected severity, and appropriate response actions (e.g., evacuation routes, safe shelters, or protective actions).

Special warning arrangements for schools, nursing homes, and other critical facilities are credited under DCF.

Credit Criteria

- (1) The activity credit criteria in Section 631.b must be met.
- (2) The warning procedures must be included in the dam failure warning and response plan or a related document (credit criterion (4) in Section 631.b).
- (3) The warning must reach people in a timely manner, especially because there may not be much time between a sudden dam failure and the point at which the water reaches homes and businesses. For example, television or radio announcements are not credited if they are the only approach used because the failure may occur during the night. The

messages should be drafted in coordination with the messages and projects credited under flood response preparations (FRP) in Activity 330 (Outreach Projects).

- (4) For those warning systems requiring specialized equipment, the equipment and procedures must be tested at least annually. Equipment that is used routinely throughout the year, such as television notices and message boards, do not need testing records for CRS credit.

Credit Points

DFW = the total of the following, up to the maximum of 35 points:

DFW1 = 5 points, if the plan includes pre-scripted messages and guidance for staff to quickly issue appropriate warnings

DFW2 = 5 points, if the public messages include information on the expected elevation of the flood waters, and instructions on when to evacuate

DFW3 = 10 points, if an outdoor voice-sound system or fixed siren system is used

DFW4 = EITHER:

- (a) 2 points, if the plan identifies the primary and support agencies responsible for door-to-door or mobile public address warning; OR
- (b) 10 points, if the plan identifies the routes, procedures, responsible staff, and equipment necessary for door-to-door or mobile public address warning

DFW5 = 10 points, if the Emergency Alert System through all channels/stations with pre-scripted draft messages is used

DFW6 = 10 points, if telephone warnings to residents and businesses are used

DFW7= Up to 10 points, if schools, hospitals, nursing homes, prisons, and similar facilities that need flood warning have NOAA Weather Radio receivers and at least one other automated backup system for receiving flood warnings, provided that the community has coordinated with NOAA and there are arrangements for issuing warnings about dam failures

Impact Adjustment

The impact adjustment for the activity is described in Section 633.

Documentation Provided by the Community

- (1) At each verification visit,
 - (a) The dam failure warning and response plan or related document that describes the emergency warning procedures (credit criterion (2) in Section 632.c and credit criterion (4) in Section 631.b). The plan or related document must be marked to show where the credited items appear.
- (2) At each verification visit and with the annual CRS recertification,
 - (a) Records showing the annual test of all equipment and material needed for the system (credit criterion (4) in Section 632.c).
 - (b) A description of the exercise, drill, or response to an actual emergency or disaster conducted during the previous year (credit criterion (6) in Section 631.b). The exercise must include the procedures for warning people credited under this element.

632.d. Dam failure response operations (DFO)

The maximum credit for this element is 30 points.

DFO credit is provided for the development of dam failure response operations that identify flood response scenarios, responsibilities, special need populations, and necessary resources. The actions undertaken that receive DFO credit should be closely coordinated with the flood response operations credited in Section 612.c (FRO).

Dam failure response operations need to be spelled out in the dam failure warning and response plan. They must include appropriate actions to be implemented when the dam failure flood threatens or occurs. The actions are conducted by the community and other cooperating agencies and organizations.

Credit Criteria

- (1) The activity credit criteria in Section 631.b must be met.
- (2) The dam failure operations actions must be included in the dam failure warning and response plan or a related document (credit criterion (4) in Section 631.b).
- (3) Credit is based on the extent and level of detail the dam failure warning and response plan provides for the response operations. General statements or an assignment of responsibilities with no specifics about what is to be done are not credited. For full credit for DFO, the plan needs to
 - (a) Describe the actions to be taken,
 - (b) Identify the office or official responsible for the action,
 - (c) Define the time needed to carry out the activity, and
 - (d) Contain other critical information that specified agencies and organizations need in order to perform their assigned responsibilities.

-
- (4) DFO4 credit is provided if there is a list of the personnel, equipment, facilities, supplies, and other resources needed to complete each task. For full credit, the list must identify what is available within the community and what is needed from private suppliers or other jurisdictions.

The National Incident Management System (NIMS 2007) requires local governments to validate the inventory of response assets using Federal Emergency Management Agency (FEMA) Resources Typing Standards. Department heads and other emergency response team members should know what kinds of resources they have available. This should be compared with the resources needed. Shortfalls may require negotiating agreements with private suppliers or other jurisdictions.

Credit Points

DFO = the sum of the following, up to the maximum of 30 points:

DFO1 = 10 points, if the community has developed scenarios that explain what could happen if a dam failed

DFO2 = 10 points, if the plan identifies response tasks and responsible community staff and other public and private organizations with responsibilities related to the response tasks in the plan

DFO3 = 5 points, for maintaining a data base of people with special needs who require evacuation assistance when a dam failure warning is issued, and for having a plan to provide transportation to secure locations

DFO4 = up to 10 points, if the plan includes a summary of estimated staff, equipment, supplies, and time required for each response task and the sources of necessary resources

Impact Adjustment

The impact adjustment for the activity is described in Section 633.

Documentation Provided by the Community

(1) At each verification visit,

- (a) The dam failure warning and response plan or related document that describes the operations and actions credited above (credit criterion (2) in Section 632.d and credit criterion (4) in Section 631.b). The plan or related document must be marked to show where the credited items appear.

- (2) At each verification visit and with the annual recertification,
 - (a) A description of the exercise, drill, or response to an actual emergency or disaster conducted during the previous year (credit criterion (6) in Section 631.b). The exercise must include the actions credited under this element.

632.e. Dam failure critical facilities planning (DCF)

The maximum credit for this element is 20 points.

DCF credit should be closely tied to the critical facilities coordination done under Section 612.d (CFP).

DCF1 credit is provided for having information about all critical facilities that could be affected by a dam failure included in the community's dam failure response plan. In general, facilities not subject to flooding during a dam failure do not need to be addressed, although in some cases loss of access can cause a critical situation. There may also be facilities in flood-free sites that will be needed to support the flood response effort.

Additional credit is provided in DCF2 if dam failure warning and response plans for individual critical facilities have been developed, reviewed, or accepted by the community.

Credit Criteria

- (1) The activity credit criteria in Section 631.b must be met.
- (2) DCF1 is a prerequisite for any DCF credit.
- (3) For DCF1 credit, the community's dam failure response plan must list the facilities considered critical in a dam failure emergency. The community must contact the facilities to determine if they need special warning arrangements. The community does not need to provide a special warning to all critical facilities, only those that need one.

There is no impact adjustment for DCF1. The community must include all critical facilities affected by a dam failure on its list.

- (4) For DCF2 credit, dam failure warning and response plans must have been developed, reviewed, or accepted by the community for individual critical facilities.

Credit Points

DCF = the sum of the following

DCF1 = up to 10 points, if the adopted plan includes

- (a) the names and phone numbers of the operators of all public and private critical facilities affected by dam failure, and

-
- b) arrangements for special warnings or early notifications directly to those critical facilities that need advance warning

DCF2 = up to 10 points, if critical facilities listed under DCF1 have their own dam failure response plans that have been developed, reviewed, or accepted by the community. The credit is prorated based on the percentage of affected critical facilities that have creditable plans

Impact Adjustment

There is no impact adjustment for DCF.

Documentation Provided by the Community

(1) At each verification visit,

- (a) A list of all public and private critical facilities affected by dam failure or needed to be operational during a dam failure flood, with the contact and warning needs information.
- (b) [For DCF2] The above ((1)(a)) list of critical facilities marked to identify those that have developed their own flood warning and response plans that have been reviewed and accepted by the community. The ISO/CRS Specialist will ask for samples of the plans for review.

(2) With the annual CRS recertification,

- (a) A page from the latest list of the critical facilities provided for DCF1, which must be updated at least annually.

633 Impact Adjustment

There is no impact adjustment for the state dam safety program (SDS). All communities that benefit from the program receive the same credit. There is no impact adjustment for DCF.

The credit points for DFR, DFW, and DFO are adjusted based on the number of buildings affected by the element. Determining these adjustments requires identifying the area affected and then counting the buildings within that area.

- (1) The area affected by a dam failure flood is shown on the inundation map required under credit criterion (2)(b) in Section 631.b. This area may be larger or smaller than the community's Special Flood Hazard Area (SFHA), depending on the size of the dam's reservoir and its distance upstream from the community.

- (2) Counting buildings for an impact adjustment is discussed in Section 302. In most cases, the number of buildings affected by an element will be the same as the number of buildings in the area expected to be inundated by a dam failure flood.

$$(1) rDFR = \frac{bDFR}{bDF}$$

$$(2) rDFW = \frac{bDFW}{bDF}$$

$$(3) rDFO = \frac{bDFO}{bDF}, \text{ where}$$

bDFR = the number of buildings that benefit from the dam failure threat recognition system,

bDFW = the number of buildings that benefit from the dam failure flood warnings,

bDFO = the number of buildings in the area covered by the dam failure operations actions, and

bDF = the number of buildings in the community expected to be inundated by a failure of all the high-hazard-potential dams that affect the community

bDFO cannot be greater than bDFW

bDFW cannot be greater than bDFR

rDFR cannot be greater than 1.0

634 Credit Calculation

$$c630 = SDS + (DFR \times rDFR) + (DFW \times rDFW) \\ + (DFO \times rDFO) + DCF1 + DCF2$$

635 For More Information

- a. Additional information, reference materials, and examples can be found at www.CRSresources.org/600.
- b. More information on dam safety activities and state programs can be found on the website for the Association of State Dam Safety Officials at www.damsafety.org.

-
- c. The following can be obtained from FEMA’s Dam Safety Office website at www.fema.gov/protecting-our-communities/plan-ahead-dam-failure/dam-failure-information.

Model State Dam Safety Program, Association of State Dam Safety Officials, FEMA-316CD. (2007).

Catalog of FEMA Dam Safety Resources, FEMA. (2008).

Emergency Action Planning for Dam Owners, FEMA-64. (2007).

636 Related Activities under the Community Rating System

- The outreach to residents required in Section 631.b (5) and developing an appropriate approach as part of a Program for Public Information can be credited under Activity 330.
- DFR is similar to element FTR under Activity 610 and element LFR under Activity 620. It credits a system that provides the community with the earliest possible notification that a flood is imminent. The three threat recognition systems should be closely coordinated.
- DFW is similar to element EWD under Activity 610 and element LFW under Activity 620. It credits a flood warning dissemination system that provides a critical linkage between the recognition of an impending flood and the community’s response to the emergency. The three warning dissemination systems should be closely coordinated.
- DFO is similar to element FRO under Activity 610 and element LFO under Activity 620. It identifies opportunities to prevent loss of life and property damage during a flood. The three response operations plans should be closely coordinated.
- DCF is similar to Activity 610 and 620 credits because it requires the maintenance of a current list of critical facilities in potential levee inundation areas, the maintenance of up-to-date contact information for each critical facility, and having plans for warning each critical facility in a timely manner.
- Documentation of the annual exercise is a prerequisite for Activities 610, 620, and 630. One exercise can meet all three activities’ requirements.