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A STUDY OF WARNING AND RESPONSE
IN TEN COLORADO COMMUNITIES
DURING THE FLOODS OF JUNE 1965

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CHAPTER I

INTRODUCTION: DISASTER AND THE WARNING PROCESS

It is helpful in studying disasters to be able to generalize about many types of disasters. It is possible to talk about disaster threats in terms that apply equally well to a flood, tornado, earthquake, or civil disturbance. This can be done because while there are differences between the several types of threats, there are also many similarities. Thus, in this report we may talk about the "warning process" in terms that will apply not only to floods, but, with a little adaptation, to most disaster situations.

In this introduction some time is spent discussing the most important variables of disaster situations. By specifying these variables, we can make important distinctions among disaster situations, and also relate them to other social phenomena such as chronic social problems or gradual social trends.¹ A second section of the introduction is devoted to a discussion of warning as a process. The three stages of the warning process are outlined. The matter of response, as it relates to warning, is also considered. The third section of the introduction informs the reader about the techniques of data collection that were used in gathering material for this study.

Types of Collective Stress

Disaster is part of the larger category of collective stress situations. Collective stress is a large unfavorable change in the inputs of some social system. An example would be a flood (the "large unfavorable change in the inputs") striking a community ("social system") or group of communities ("social system").

The term social system can be applied to collectives ranging from enduring small groups, like a family, all the way up to national societies or a world social system. In this monograph, we are primarily interested in intermediate units such as organizations, communities, and regions. Particular attention is paid to organizations within the various communities and to county and state-wide organizations.

The inputs of a social system include its physical environment. The physical environment may change for the worse through floods, storms, explosions, droughts, plagues, and the like.

In a disaster there is an extreme change in the input to a social system. In the case of the Colorado floods the inputs were the various floods along the South Platte and Arkansas Rivers. The social systems were the various communities, from small towns to the city of Denver, and organizations both within the communities and state-wide (civil defense, weather bureau, police, fire departments, and the like).

Barton² suggests three dimensions by means of which stress situations, and consequently, disaster situations can be typed: (1) the scope of the situation primarily affected; (2) the speed and duration of the impact; and (3) the degree of institutional preparation. Stress on a large system naturally affects the smaller units that make it up. A smaller unit can thus be studied under stress limited to that unit, or within the context of a much larger stress situation. We can study "family stress situations" (How does a flood affect family solidarity? Does it strain family relationships, or pull members closer to one another?) or "families in community stress". (How do families respond to instructions to evacuate in time of flood warning?) Some things will be the same regardless of the larger context, and others will be different according to the total scope of the stress. It is important to distinguish the focus of the particular study from the total scope of the collective stress situation. In this report, the focus is directed at organizations within communities and also state-wide organizations.

Time dimensions are also important in typing stress situations. These dimensions include the speed with which an unfavorable change develops and the duration and frequency of the external change. Time may also include the time of day or season of the year. Changes coming without warning are likely to create greater loss and leave the social system with less capacity to respond to the loss. If the change is gradual or predictable in advance, specific preparations to prevent or respond to the damage are much more likely to be made. If the impact is long-continued or recurring, long-range social adaptations can be worked out, either to minimize losses, to restore the system's functioning on another basis, or to lower the member's aspirations to match the system's lower capacity to meet their needs. The differences that time dimensions make can be seen in a flash flood, with no warning, in an area with little or no prior experience in floods as compared to an area where a hurricane builds up at sea, is traced in its expected course for days, and is an annual occurrence.

The systems affected can be classified also by their degree of preparedness for stress, or for particular kinds of stress. A crucial characteristic of stress is the extent to which the system has well-rehearsed roles for individuals, well integrated in organizations and plans, to deal with a given type of impact.

Another important variable is intensity of stress. This variable is included in this study because it has relevance to the affect on a community and the response the community is able to make given the same scope, time, and preparedness, a minor flood may cause discomfort and decline of resources, while a major flood may cause death and destruction and severely impair the community's ability to respond effectively.

The great advantage of this typology is that it enables us to generalize to disasters of many types. The kind of stress -- be it flood, fire, or earthquake -- is relevant, but it is minimized. Regardless of the type of stress, the warning process is essentially the same, the major difference is the content of the warning. This typology is also useful in that it can be moved to the level of propositions. Propositions relate variates to each other. In this case, different social processes result from different combinations

of the four variables. An example given by Barton³ is that when the onset of stress is sudden and institutional preparedness low, we would expect the main immediate response to be mass self help rather than activity of formal organizations, the distribution of individual reactions and unorganized mass processes would be more important determinants of the outcome than organized systems of roles.

A table may be made classifying the several floods that occurred in eastern Colorado in June 1965. Developing such a typology and then combining the variables of scope, time, preparedness, and intensity, we can see that the outside agent -- in the case of the several Colorado communities, floods -- is only one variable in disaster. The flood itself is not the disaster, but the disaster agent. The disaster agent is only the incident that puts stress on the social system. Whether or not the disaster agent will lead to a disaster is also dependent on a number of other matters: intensity, scope, time, and preparedness. Two communities may be struck by floods (the disaster agent) of equal intensity and one community may experience only added stress in its life while the other community experiences destruction, death, and severe disaster. The difference between the two situations is not found in the disaster agent (that is the same) but in the total scope and/or the time dimensions and/or the degree of preparedness. The first community may have had prior warning and the preparedness to get people out of the danger area and property buttressed for the onslaught. The second community may have been hit with no warning and had no plans for evacuating people and protecting property.

After considering the various dimensions of the stress situations in Colorado, this report devotes central attention to the warning process.

Warning As A Process

Having talked about the methods of classifying disasters, we may turn to the specific topic of this report -- the warning process. Harry Williams⁴, Raymond Mack and George Baker⁵, and others⁶ have looked at the warning system and the warning process. The key units, such as civil defense, police, and fire departments, involved are not viewed as discrete entities so much as interrelated parts of a system. The output of the warning system, is seen less as an accomplished act than as an ongoing process including a number of inter-related activities and procedures.

Warning system and warning process conceived in such a manner helps to explain the inter-relatedness of the various parts of the system and the interdependence of the various activities in warning. Thus, we become aware of the possibility that an inadequacy, or breakdown, in a certain part of the disaster warning process may result in failure or impediment to the system as a whole. Similarly a modification in one aspect of a warning system may, indeed, result in change in another part of it. We may also see that not only is warning made up of parts working together, but that the warning system itself is a part of a larger system, i.e., the total response of an organization or community to the impact of disaster. As we look at warning it is important to keep in mind that it is a system comprised of smaller units and itself a part of a larger system. In the same manner the warning process includes a number of stages and is itself in some ways a stage in a larger process.

The warning process has been viewed as consisting of a number of stages. A typology used in previous research at The Ohio State University Disaster Research Center is used in this report. The warning process consists of (1) forecast, (2) alert, and (3) confirmation. Added to these, in this report is (4) response. Response of individuals is viewed as beyond the limits of warning, but it is an excellent indication of whether the warning process functioned properly.

The forecast activities include the detection and measurement of environmental changes and the collation and evaluation of these measurements, especially as they indicate the possibility of impending disaster. A river watch may issue "forecasts" of rising waters. These indicate that the river is steadily rising and the conditions are building toward possible flood stage. The implication of these forecasts is that the public should be aware of the possibility of a dangerous flood. Forecast activities include the following: (1) detection and measurements or estimation of changes in the environment which could result in a danger of one sort or another; (2) collation and evaluation of the incoming information about environmental danger; (3) decisions on who should be warned, about what danger, and in what way; (4) transmission of a warning message or messages to those whom it has been decided to warn.

The second stage is that of alert. The term alert has been used to indicate the second stage in the warning process, although the term warning itself -- especially as employed by the weather bureau -- would more nearly suggest the kinds of activities associated with the stage. The use of the word alert, however, eliminates the confusion with the total warning process. The alert differs from the forecast not so much in the steps followed as in the content of the message. The same four steps are followed in the alert that were followed in the forecast stage. During the alert, people are given messages about the danger that is now present and what steps to take. During the forecast stage the message is that "it" has a good chance of happening, but in the alert stage the message is more emphatic, "this is it!"

During the forecast and the alert period, messages to official agencies and to the public should seek to be: immediate timewise, clear and specific, consistent, and authoritative. These ideal features of the forecast and alert will be elaborated more fully in the body of the report.

Time is a key factor in enabling the system to respond effectively. Two days of forecast may allow time to shore up the dikes and prevent flooding. Two hours of alert may allow time to evacuate, and thus eliminate or keep death rates low. No warning, such as in a flash flood, may mean heavy loss of life and property.

Messages should be clear and specific to eliminate ambiguity. A message to evacuate to "high ground" during Hurricane Audrey in Lower Cameron Parish, Louisiana was interpreted to mean evacuation to ridges ("cheniers") 6-12 feet above ground. This was not high enough, and the consequences were disastrous. People should be told, as specifically as possible, when to act, what to do, to what end, and how much time there is to do it. The forecast and particularly the alert should be consistent. Williams⁸ sights the case of a message to a flood-threatened community from a sound truck: "An all-time record flood is going to inundate the city. You must evacuate the city immediately. (Pause) The _____ Theater is presenting two exciting features tonight. Be sure to see these pictures at the _____ Theater tonight." Incompatible messages

can cancel or devalue warning information. It is helpful to think of the several messages issued at any stage as really being one message which may be summed up as "warning." All messages should build and reinforce the central forecast and alert message. All that has taken place in the warning process up to this point is meant to aid people in correctly interpreting the forecast and alert messages and in taking protective action.

The third stage is confirmation. The warning process is not complete when the alarm has been sounded. Confirmation -- the attempt to determine the meaning of an alert signal -- must follow the alert. The outcome of this third stage will largely determine the countermeasures those in danger will take -- or fail to take. Only in those circumstances where the alert signal and the appropriate responses have become automatic can the sounding of an alert be defined in any way as the terminating step in the process of warning a population of danger. Williams suggests: "When people get a message saying 'This is it!' they seem to need a second message which says, 'yes, this really is it!'"⁹

How a person confirms a message is dependent on a number of factors. One of these factors is the message itself. As just mentioned, the immediacy, clarity, specificity, consistency, and authoritativeness of the forecast and alert influence the confirmation and response of the recipients.

The social setting in which one hears the message is a significant variable in confirmation. Is he alone, with his family, or at the office? Visual observations (or the lack of them) may be seen to play an important role in confirmation. Is the river rising? Does it look threatening? Are others, particularly officials, taking action that would tend to confirm the seriousness of the threat? The social and cultural setting of the recipient is also important. Is this an area where there has been repeated experience with this type of disaster? Is this a cultural setting in which the head of the household is the only one who is expected to make a decision on whether to evacuate? All of these variables may play a role in the confirmation of an alert.

The confirmation stage includes the last three steps of the seven steps included in Williams' scheme: interpretation of the warning message by the recipients and action by the recipients; feedback of information about the interpretation and actions of the recipients to the issuers of warning messages; new warnings, of possible and desirable, corrected in terms of responses to the first warning messages.¹⁰ Response is considered as an indicator of the effectiveness of forecast, alert and confirmation.

Techniques of Data Collection

The material upon which this report is based was collected in the course of field trips to the scene by teams from The Ohio State University Disaster Research Center. Open-ended interviews were obtained from members of 46 different organizations in a 9 county area. The interviews were collected during the time period of two weeks immediately following the floods, and focused on the following types of agencies: police and sheriff's departments, fire departments, civil defense, city government, Colorado state patrol, radio stations, and so forth.

Other sources of data include questionnaires mailed to radio stations throughout eastern Colorado, Army Corps of Engineers floodplain reports, public and organizational releases, newspaper reports and communications tapes from cooperating organizations. Work done by Thomas Drabek¹¹ concerning the response of people, and particularly family groups, to the flood serves as background material.

Notes: Chapter I

1. The material in this section follows closely that in Allen H. Barton, Social Organization Under Stress: A Sociological Review of Disaster Studies (Washington, D.C.: National Academy of Sciences -- National Research Council, Publication 1032), pp. 3-6.
2. Ibid.
3. Ibid., p. 5.
4. Harry B. Williams, "Human Factors in Warning-and-Response Systems," The Threat of Impending Disaster, (eds.) George H. Grosse, Henry Weschler, and Milton Greenblatt (Cambridge: The MIT Press, 1964), p. 79.
5. Raymond W. Mack and George W. Baker, The Occasion Instant: The Structure of Social Responses to Unanticipated Air Raid Warnings (Washington, D.C.: National Academy of Sciences -- National Research Council, Publication 945, 1961).
6. A series of research reports of the Disaster Research Center at Ohio State University deal with the subject of warning. In all cases, warning is considered as a process rather than a discrete act.
7. David Adams, "The Minneapolis Tornadoes, May 6, 1965: Notes on the Warning Process," Disaster Research Center, Report No. 16, mimeographed (Columbus: Disaster Research Center, The Ohio State University, 1965), p. 3.
8. Williams, "Human Factors," p. 82.
9. Ibid., p. 100.
10. Ibid., pp. 82-83.
11. Thomas E. Drabek, "Reactions to Sudden, Unfamiliar, and Unexpected Stress," Final Progress Report to the National Institute of Mental Health for Public Health Service, Research Grant Number MH 12298-01, 1967.

CHAPTER II

OVERVIEW OF THE FLOOD SITUATION AND THE WARNING SYSTEM

Colorado is a state of great contrast geographically. In the western part of the state are the Rocky Mountains, and the eastern part of the state slopes off into a great plateau. The area of flooding was in the eastern part of the state from the slopes of the Rocky Mountains to the Kansas border.

During the first two weeks of June 1965 a unique weather pattern developed over the state of Colorado. In contrast to the usual dry climate for which the area is noted, much of the state experienced unusually cold and rainy weather. Denver, for example, received 3.55 inches of rain, 2.89 inches in excess of the average for the period. From Sunday, June 13 to Wednesday, June 16, torrential rains, coupled with tornadoes which touched down high along the eastern slope of the Rocky Mountains, initiated the most destructive floods in Colorado history.

In order to understand the Colorado floods it is essential to bear in mind that it is not one flood referred to in this report, but many. In some cases a single community was hit by floods from one source and then another. The respondents who experienced the floods were not always sure which flood it was they were experiencing at a particular time.

The Colorado floods may be viewed chronologically, geographically, and in order of severity. In various places throughout this report the floods are viewed in each of the above ways. In order to allow the reader an overview of the situation, however, this section will view the floods primarily from a geographical perspective. Subsequent chapters will describe the disaster-stricken communities in some detail.

It is helpful to picture the eastern part of the state of Colorado as divided into two approximately equal parts, north and south. This report refers to six communities in the northeast quadrant of the state and four communities in the southeast quadrant of the state. These areas are referred to as Area I and Area II, respectively (see Figure 1). The floods fall into two major groups. Group I includes the floods along the South Platte River in the northeast quadrant of the state (Area I) and Group II includes those floods along the Arkansas River in the southeast quadrant of the state (Area II). Both groups of floods can be seen as radiating out from the general area of Palmer Lake between Denver and Colorado Springs.

Group I, Area I

Geographically, Group I floods can be viewed from south to north. From the general area of Palmer Lake, the flood waters proceeded north through Castle Rock (Douglas County), Littleton and Englewood (Arapahoe County), Denver (Denver County), Brighton (Adams County), and Greeley (Weld County).

Early Wednesday afternoon, June 16, a tornado ripped through the community of Palmer Lake. There were a number of tornadoes sighted on the eastern slopes of the Rocky Mountains during this time period. A large thunderstorm followed the tornado and dropped 3 to 5 inches of rain within a few hours. The downpour produced a "wall" of water, reported from 6 to 30 feet high, along Plum Creek which crashed through Castle Rock (Douglas County) south of Denver. North of Castle Rock, Plum Creek joined the South Platte River and the flood waters proceeded north where they struck the Denver suburbs of Littleton and Englewood (Arapahoe County). It was about 8:30 p.m. Wednesday when the water hit these communities. The flood waters continued through the heart of Denver (Denver County) cutting a path from 2 to 12 blocks wide.

The waters of the South Platte River flowed north from Denver to the town of Brighton, in the northwestern section of Adams County. The crest waters of the South Platte River did not strike Brighton until 9:00 a.m. Thursday. Early Wednesday evening while the town of Brighton waited for the crest on the South Platte River, the people of eastern Adams County were being troubled by floods and several small streams. The South Platte flood waters moved north from Brighton toward Greeley (Weld County). By the time the river reached Greeley on Thursday evening, the crest had weakened to the point that it did not cause any problems. The people of Greeley, however, were still busy fighting the waters of the Cache La Poudre River that had hit the community Thursday afternoon coming from the west. The Cache La Poudre River joined the South Platte River to the east of Greeley and the flood waters ran themselves out.

Figure 1: COMMUNITIES INCLUDED IN THE STUDY

	Community	County
Group I, Area I	Castle Rock	Douglas
	Littleton	Arapahoe
	Englewood	Arapahoe
	Denver	Denver
	Brighton	Adams
	Greeley	Weld
Group II, Area II	Pueblo	Pueblo
	La Junta	Otero
	Las Animas	Bent
	Lamar	Prowers

Group II, Area II

The same storm that struck the Palmer Lake area and resulted in flooding through the northeast quadrant of the state also precipitated high water across the southeast quadrant. Floods in Area II (southeast quadrant) were the result of rising water along the Arkansas River and several creeks and streams. Looking at this area from a geographical perspective, we begin on the eastern slopes of the Rocky Mountains south of Denver. The water rolled off this hills and into Fountain Creek. Fountain Creek flows into and through the city of Pueblo (Pueblo County) from the north and joins the Arkansas River which comes into and through Pueblo from the west. The Arkansas River goes east from Pueblo across Colorado and into Kansas. Communities that were flooded along the river included La Junta (Otero County), Las Animas (Bent County), and Lamar, Granada, and Holly (Prowers County).

Coming from the general vicinity of Palmer Lake on the eastern slope of the Rocky Mountains, south of Denver, flood waters flowed south along the Fountain Creek and crested in Pueblo (Pueblo County), at 9:30 p.m. Thursday, June 17. Fountain Creek flows through Pueblo from the north to the south. It was this creek that caused the severe flooding. The Arkansas River also flows through Pueblo, from west to east. Immediately outside of the southeast corner of the city, Fountain Creek flows into the Arkansas River and the river continues east across the state.

The next community along the Arkansas River that is discussed in this report is La Junta (Otero County). Waters crested at La Junta at 11:00 a.m. Thursday. It may seem unusual that La Junta, downstream from Pueblo, was actually flooded before Pueblo. The reasons for this are that while both communities are situated on the Arkansas River, neither the flood in Pueblo nor the first crest in La Junta were caused by the waters of the Arkansas. The flood in Pueblo came from Fountain Creek and the first crest at La Junta at 11:00 a.m. Thursday, was caused by waters from Timpas Creek. La Junta had not recovered from the first flood when it was hit by waters from the Arkansas River, the crest striking at 8:00 a.m. Friday.

Las Animas (Bent County) 20 miles downstream from La Junta did not experience flooding. The crest passed through the town without overflowing the dikes that had been raised to a greater height by sandbagging. The community is discussed in this report because of the interesting happenings growing out of its process of warning, evacuation, and prevention.

Just east of Las Animas the Arkansas River was held in check by the dam on the John Martin Reservoir. East of the dam there were more floods in the river. These floods were not caused by the highwaters coming down the Arkansas from Pueblo, La Junta and Las Animas -- those waters were checked by the dam on the John Martin Reservoir -- but by the high waters flowing into the Arkansas from tributaries east of the dam. Flooding east of the dam was from two major sources. The first group of floods were caused by waters from several creeks along the Arkansas River. A number of creeks flooded Granada and Holly (Prowers County) on Thursday and Lamar (Prowers County) was flooded by waters from Willow Creek, the crest striking at 1:30 a.m. Friday. The second source of flooding was the Arkansas River which flooded Lamar later on Friday.

By Sunday, June 20, there were twelve known deaths and ten missing in Colorado. State-wide damage estimates, made later by the Army Corps of Engineers, exceeded half of a billion dollars.

Warning

In more than one sense the floods and the actions they generated may be seen as radiating out from the area south of Denver. The floods started and radiated out in the general area of Palmer Lake. Group I floods moved north and then east and Group II floods moved south and then east. In a very rough sense, the warnings and preparations moved in the same pattern.

The warning system may be viewed as a single system with many levels, e.g., organization, community, and state; or it may be viewed as several systems, some with more than one level. The model that fits the Colorado floods most closely is the one that views warning as several systems: at times working as one system, at times working complementarily, at times working independently, and at times working at cross-purposes.

The organizations involved in the various floods that took place run on a scale from small volunteer fire departments and part time constables to the police and fire departments of Denver which are comparable to those of most other major cities in the country. Just as the scale of organizations runs from small volunteer to large professional organizations so too the scale of communities runs from those with populations of less than a thousand to the city of Denver with half a million.

In addition to local organizations and communities there were also state-wide organizations that played important roles in the various disaster situations. Three of the key state-wide organizations discussed in this report are the following: the Colorado State Patrol, the Colorado CCD (Office of Civil Defense), and the Colorado Department of Natural Resources.

The Colorado State Patrol has three administrative divisions in the eastern half of the state: Denver (also the state-wide headquarters), Greeley, and Pueblo. All of the men assigned to eastern Colorado are responsible to one of these offices. Communications for the state patrol and also for many of the local agencies are dependent upon these three cities. In the counties of Otero, Bent, and Prowers all protective agencies within a county (state patrol, sheriff, and police departments) share a single frequency and a common dispatcher. This arrangement is feasible because of the low population of the counties and consequently the small numbers of protective personnel required. As soon as one organization broadcasts information the other agencies in that county -- assuming they are using their radios -- are automatically advised of the situation.

A second state-wide organization that was active during the floods was the Colorado CCD. Civil Defense attempted to gather information on flood conditions and relay it to local communities. Obtaining reliable information proved difficult for the Colorado CCD and the task of sorting and validating

what was received was a complex and time consuming job. Difficulties also arose in relaying information to local officials because Colorado OCD had only marginally effective communications equipment and had to rely heavily on telephones.

A third state-wide organization at work was the Colorado Department of Natural Resources. The department has its administrative headquarters in Denver. Its staff numbers some forty commissioners and deputy commissioners capable of gauging and measuring stream flows throughout the state. The department thus has access to professional figures and estimates on the present and anticipated future flow of any stream in Colorado, and might reasonably be expected to provide this valuable information to flood-threatened communities, thereby, better enabling them to prepare themselves.

An analysis of the warning system in each of the communities studied is contained in chapter 4. We now turn to a detailed description of the several flooded communities.

CHAPTER III

DESCRIPTION OF THE SEVERAL FLOODED COMMUNITIES

Group I, Area I (South Platte River, Northeast Quadrant)

Castle Rock (Douglas County)

Castle Rock, the county seat of Douglas County, is a community of 1,152 located along the edge of the mountains near the Pike National Forest, south of Denver. The Douglas County Office of Civil Defense director was holding a field hospital drill early Wednesday afternoon. (The directorship is a professional position paid on a three-quarter time basis.) Several doctors, the Arapahoe Rescue Patrol, and the Littleton Civil Defense director were in attendance, along with a group of boy scouts who were being used as simulated casualties. At 1:45 pm, while the hospital drill was in operation, the Douglas County sheriff received a call reporting a tornado in the village of Palmer Lake, south of Castle Rock. The sheriff had two assistants, one man in the office and one man in the field. The department has two radio-equipped cars. After checking on the report and ascertaining the seriousness of the situation, the sheriff notified the CD director at 2:45pm, that the hospital drill "was not going to be practice from now on." Some of the doctors and nurses serving at the field hospital drill left for the Denver area upon learning that a tornado had also touched down near that city. A tornado casualty was brought into the hospital and was sent from there to the local doctor's office where she was treated. The hospital drill was then terminated.

The Douglas County CD director went home to check on his family and give them instruction about what to do if things got bad enough. He saw a woman stranded in a car and he and a neighbor rescued the woman and three children and left them at the first house they reached. The director walked back downtown where he met the sheriff and the two of them took a quick tour of the town. The director told the sheriff, about 4:00pm, to call in on the police radio and tell them that the Douglas County CD director "declares a state of disaster, not emergency, disaster." Helicopters were requested to rescue a minimum of one hundred people. Blankets, cots, food, and water were requested from the army. The local telephone company called Denver for emergency generators. The high school was opened, by the sheriff and the director, and used as the center for rescue operations. Helicopters took off and landed from the football field, and buses were used to take people from the field to the school. A radio-equipped Arapahoe Rescue Patrol car was placed at the school to serve as a communications center. The civil defense director used the school as a base from which to work. By 7:00pm, the relief operation was well under way. Helicopters were working, emergency generators had been received, and the Red Cross and Army food units were in operation.

As early as 2:00pm, the sheriff had aired a warning via Colorado State Patrol that the heavy rains presented a flood threat. When the flash flood crashed through Castle Rock about 2:45pm the sheriff radioed the

Figure 2: Chronological Outline of Group I, Area I (Northeast Quadrant)
 Tuesday June 15 through Thursday June 17

	Castle Rock (Douglas Co.)	Littleton (Arapahoe Co.)	Englewood (Arapahoe Co.)	Denver (Denver Co.)	Brighton (Adams Co.)	Greeley (Weld Co.)
Alert Received by Official Organization	Wed. 1:45pm	Wed. 3:00pm	Wed. 5:00pm	Wed. 5:00pm	Wed. late 7:00pm aft.	Tues. Wed. Day- 7:45pm time
Alert Confirmed by Official Organization	2:45pm	3:30pm	5:00pm	5:00pm	late 7:00pm aft.	Day- 7:45pm time
Alert Broad- cast to Other Official Organizations	4:00pm	5:44pm	5:00pm	5:00pm	late 7:00pm aft.	day- 9:30pm time
Alert Broad- cast to the Public	none	5:55pm	5:00pm	5:00pm	late 7:00pm aft.	11:00pm night
Crest Strikes	2:45pm	8:15- 8:45pm	8:30- 9:00pm	9:30- 10:00pm	later Thurs aft. 9:30am	Thurs. aft. 2:30am
Subsequent Crest Strikes	none	none	none	none	late none aft.	none none

Denver area that a flood was definitely coming and urged that Sedalia, Louviers, and Littleton, communities between Castle Rock and Denver, be evacuated. Crests were reported as high as 40 feet at Castle Rock. From Wednesday until Thursday afternoon there were a number of evacuees in Castle Rock and the nearby communities. The numbers are as follows: Castle Rock, 250; Larkspur, 125-150; Louviers, 25; Miller Ranch, 50; and Sedalia, 50. On Friday buses took evacuees to Denver and Colorado Springs.

Castle Rock itself received no organized warning about the flood. The sheriff's department was the only agency active before the flood actually struck, and there was no chance for the personnel of this small organization to issue systematic warnings to the populace. Interorganizational contact was limited to a warning to the Douglas County CD director and those participating in the field hospital drill and radio alerts to the Denver area. In Castle Rock the efforts of the sheriff's department were directed to rescuing people as the flood passed through and warning a small group of mobile home dwellers to leave an area immediately before a bridge collapsed, inundating that area.

Two problems confronted the sheriff's department in the course of evacuation operations. One was to order sightseers out of exposed areas and the other was to convince reluctant people to evacuate. Perhaps because of lack of any prior experience, the populace was reluctant to believe the seriousness of the situation until it was upon them.

The Douglas County civil defense director helped to coordinate the rescue and particularly the relief operations.

Littleton (Arapahoe County)

Arapahoe County, touching the southern and eastern edges of Denver, includes the two suburban communities of Littleton and Englewood within its boundaries. Littleton is the smaller of the two cities with 13,670 residents compared to Englewood's 33,398. Littleton is also farther south of Denver than Englewood. The South Platte River flows through the western part of both cities as it approaches Denver. A Corps of Engineers report¹ tabulates nineteen floods which have occurred on the South Platte River in the Denver area since 1844. It is interesting to note that the "Great Flood" of 1864 was not primarily a flood on the South Platte River, but a flood on its tributary, Cherry Creek, which drains approximately 409 square miles.

In the years between the flood of 1864 and that of June, 1965, two major changes had altered the potential flood threat to the Denver area.

The first was the construction of dams on the Cheesman, about eighteen miles above Littleton in the early twenties and Cherry Creek on that tributary about ten miles from its confluence with the Platte completed in 1950. Nonetheless, at least 2,000 square miles of drainage area converging upon the Denver metropolitan area was unprotected by flood control works in June 1965.²

At least three significant facts were known to public officials of the Denver area in June of 1965. The first was that the area had potential for tremendous springtime precipitation. The second fact was that of the nineteen floods in the region one of the most disasterous had come primarily from a drainage basin of approximately 409 square miles. The third was that at least 2,000 square miles of the drainage area converging upon the Denver area was unprotected by flood control works.³

The city of Littleton is a quiet residential suburb located approximately ten miles from downtown Denver. Incorporated in 1890, the community spent the first sixty-five years of its existence as a farm trading center and the seat of government for Arapahoe County. In the middle 50's the outward growth of the Denver metropolitan area and the decision to locate a major aerospace industry approximately six miles southwest of the city made the farmlands around the community blossom into subdivisions of middle and upper middle class single family houses. Through natural population increase and annexation of these areas Littleton grew from 3,370 in 1950 to 13,670 in 1960 and approximately 20,000 in June of 1965.⁴

At the time of the flood the Littleton police department was operating with a personnel complement of thirty-one men. There is a chief, a captain, two lieutenants (one a staff officer in charge of planning and the other a line officer in charge of four detectives) both of whom assume ranking positions in emergencies, four sergeants, four dispatchers, and ten patrolmen. A typical shift would find one shift sergeant and three men actually on the street in the patrol operation. The police department operates a fleet of seven vehicles, six sedans and one modified station wagon (for dog control officers). All are equipped with two-way radios capable of base-to-car and car-to-car communication. The dispatcher located at the department headquarters in city hall has access to four incoming telephone lines, the LETS (Law Enforcement Teletype System) with other police agencies, and a NAWAS (National Warning System) Civil Defense emergency telephone. In addition, the department monitors the Colorado State Patrol radio, the Arapahoe County sheriff's radio, and cross monitors with the Littleton fire and public works radios which are on separate frequencies. Physically the department was located in the front portion of the first floor of the city hall. In addition to the regular personnel, the department is assisted by approximately ten members of a police reserve organization who are trained and uniformed police auxiliaries holding outside civilian jobs.

The fire department personnel complement of twenty-five men includes a chief, two captains, two lieutenants and twenty operators, firemen and dispatchers. The department operates nine pieces of equipment from two stations. Station #1 is equipped with the central dispatching facilities which are set up to cross-monitor all three city radio frequencies. In any emergency dispatches from the police and public works departments can operate from the fire department console. Both fire stations are equipped with auxiliary

power generators in case of failure of the public utility. The fire department has two incoming emergency telephone lines at fire house #1 and one unlisted house phone. In addition it has "hot" phones to the Denver fire department and the Martin Company fire department and routinely monitors the Denver fire department radio frequency. The paid fire department personnel are assisted by approximately twenty-two members of the Littleton Volunteer Fire Department who respond to emergencies and particularly major fires in the Littleton Fire Protection District. The Littleton Fire Protection District is an area that includes Littleton and the surrounding area. This district, which pays approximately half of the fire department's annual budget, furnishes four pieces of equipment which are utilized by the city. The district includes approximately forty square miles of unincorporated area outside the city.

The Littleton Office of Civil Defense is staffed entirely by volunteers and is nominally supported financially by the city. The director coordinates with the various departments of the city and drafts and reviews master plans for various sorts of emergencies. The Littleton CD has responsibility for an area that is larger than the municipal limits; it includes approximately the same area as the Littleton Fire Protection District. Master plans for seven types of emergencies had been prepared by the director and the one relating to flood disaster had been reviewed in an exercise with department and division heads early in 1964. The Littleton Civil Defense director is also head of the Arapahoe Rescue Patrol, a group of approximately fifty high school boys who have been given extensive training in first aid, search and rescue, and mountain rescue operations. They can be mobilized for these purposes and are used extensively by the city on various occasions. They are all volunteers.

The Arapahoe County Sheriff's Department has a complement of 55 personnel. They do not patrol the incorporated areas.

The Denver Post weather bulletin in the Wednesday afternoon paper predicted mostly cloudy weather through Thursday with scattered showers and thunder storms. Not much change in temperature was anticipated. Later reports were to indicate severe storm activity over a large area to the south and southeast of the city beginning late in the morning and continuing through the early afternoon. A 6 inch rain and flood followed a tornado in the community of Palmer Lake approximately 40 miles south of Littleton on the Plum Creek drainage basin.⁵ At the time of the flood many of Littleton's key officials were out of the city for one reason or another. The city manager, administrative assistant, and various members of the city council were in Estes Park, Colorado to attend a meeting of the Colorado Municipal League. The police chief was on vacation in southern California. The fire chief and one fire captain were attending a convention in Cortez, Colorado. The civil defense director spent the early afternoon with members of the Arapahoe Rescue Patrol at an exercise in Castle Rock, Colorado, south of the city. The director of public works had been designated as the acting city manager during the manager's stay at the Estes Park convention.

At 1:00 p.m. on Wednesday the Arapahoe County sheriff's department learned that a tornado had struck the Cherry Creek area east of Englewood. Investigation disclosed the fact that several houses were damaged and that Cherry Creek was flooding. Cherry Creek was not deemed to be a major concern; it was thought that the large reservoir that sits outside the creek would hold the water.

The Littleton Civil Defense director reported heavy rain between 1:00 and 3:00 p.m., but no flooding in Castle Rock, approximately 20 miles north of Palmer Lake and downstream on Plum Creek. About 2:00 p.m. the director of public works received a telephone call from a local construction contractor who stated he had heard a report of flooding on Plum Creek which empties into the South Platte approximately 3 miles above Littleton. He stated he was passing along the information. The director contacted three state and local agencies but was unable to confirm this information.

Around 3:00 p.m. the Arapahoe County CD director and the sheriff were in the Cherry Creek area investigating the tornado damage. Before leaving his home, the county director had called the state civil defense in Denver to advise them of the tornado situation and they, in turn, had told him that they had reports of a large amount of water coming down Plum Creek into the Platte, but they had no information as to the expected amount or time of arrival.

At approximately 3:00 p.m., the Douglas County sheriff broadcast a general warning over the state patrol frequency, notifying northern Douglas County and southern Arapahoe County that a large crest was coming down the South Platte from Castle Rock, and urging that low-lying areas in the Platte Valley be evacuated. This warning was received by several agencies, including Arapahoe County CD and sheriff's departments. Upon receiving the warning from Douglas County, the sheriff and county CD director returned to the sheriff's office in Littleton where the director remained for the rest of the evening. The sheriff dispatched cars to the county line to keep him advised as to the water's progress. No other organizations were alerted, since the sheriff felt that the information was "common knowledge" and most certainly was being repeated on both state patrol and commercial radio stations. Sheriff's deputies began evacuations in the areas south of Littleton, going door to door and using loudspeakers.

The Littleton police department and the Littleton public works director (the acting city manager) were attempting to confirm reports they had received of severe storms and flooding. At 3:30 p.m. the police, after contacting a number of sources, became convinced that there was indeed to be a flood, although they had no information on the extent of it. All off-duty police personnel were called and ordered to stand by for duty. The first official word of any flood activity on Plum Creek, according to the Littleton police radio log, was received at 5:15 p.m. (Time reports between 4:00 and 5:45 p.m. are not stated as absolutes but rather as estimates.) The report indicated severe flooding in Castle Rock.

At 5:44 p.m. the police dispatcher was notified via state patrol radio that Sedalia, approximately 7 miles downstream from Castle Rock, was being instructed to evacuate all low-lying areas. The state patrol dispatcher advised that low-lying areas of Littleton should also be instructed to evacuate in the face of the onrushing flood. The state patrol dispatcher placed the flood at that time to be a 20 foot wall of water some 1,000 yards wide moving with great speed down the valley. The approximate time of arrival in Littleton was placed at one-half hour. The Arapahoe County sheriff had received the same information. After hurriedly conferring with the public works director at 5:55 p.m. the acting police chief assigned cars with public address systems to evacuate residents in specific river bottom areas. People

were warned to leave immediately, but many were reluctant to do so. Police assisted a number of aged and infirm individuals who were unable to leave by themselves.

At 6:03 p.m. the acting fire chief conferred with the acting police chief concerning methods of completely covering the area. It was decided that the fire department, according to prearranged plan, would concentrate on areas south of the city limits and west of the river. For its part, the police department initially had four patrol cars for the area west of the river and north of Bowles Avenue and the entire area east of the river. Cars of the Arapahoe County sheriff and public works vehicles evacuating their own facilities were also in the area. In general all the vehicles described above were equipped with two-way radios and outside public address loudspeakers. For densely populated areas evacuated by the police department, the general method of operation was to cruise the area giving announcements over the public address system. The fire department and sheriff's office, working more sparsely populated areas, found it necessary to make door-to-door individual contact with residents in the area. Both methods, however, were used by all three agencies. The typical message given to the evacuees by the public officials is very close to this interview statement.

I believe I reported to the people that there was a report of an impending flood which would arrive in approximately 10 to 15 minutes and that our last report was that the town of Sedalia had been entirely evacuated; that the crest was approximately 20 feet high and that anybody close to the river should evacuate immediately.

Residents were not directed to any assembly point and shelters were not set up until the water actually hit, but they were then set up rapidly. Some 500 residents were evacuated west of the Platte by the fire department, while approximately 1,000 were removed by the police from the east side of the river. The lack of specific directions given to residents was not the problem that it might have been in another city, for within Littleton, the terrain is such that well-defined areas of "high" and "low" ground exist and are recognized by nearly all residents. Evacuating agencies were well aware of this point, citing it as one of the major reasons they felt safe in simply warning people to leave, without further direction.

At 6:00 p.m. the city manager was notified by one of the councilmen at the Estes Park convention that he had heard television reports of the notice to evacuate low-lying areas of Littleton. The city manager returned to his hotel and contacted the acting police chief and public works director for confirmation. Upon receiving a status report from these personnel, he picked up the administrative assistant and left Estes Park for Littleton at about 6:15 p.m.

By shortly after 6:00 p.m. most off-duty police and fire personnel had been called into service. At 6:14 p.m. volunteer firemen were called by general alarm. By 6:30 p.m. roadblocks had been set up around the perimeter of the evacuation area to prevent infiltration by residents and curiosity seekers. By 6:45 p.m. the wait for the flood had begun. The civil defense director went to Blakeland approximately 3 miles south of the city to watch the river. He was in radio contact with the police and fire dispatcher.

The dispatcher in the public works office who had been on duty since approximately 5:45 p.m. was in communication with his field vehicles. The evacuation (except for curiosity seekers entering the area and residents moving out of the area) was virtually completed.

In the potential flood area the tenor of the evacuation effort rose around 7:30 p.m. Where earlier evacuation notices had been on a more permissive scale of merely informing the people of the potential threat and urging them to evacuate, it now assumed a more official tone. Because the true severity of the flood and its approximate time of arrival had been accurately determined, warnings to evacuate now were followed by threats of arrest and removal for the individual's own safety. One such arrest and removal was actually made. At 8:00 p.m. the evacuation was still under way. A house-to-house check showed some persons still in the flood area, especially right along the river. All free personnel were assigned to make sure that everyone was out of the area. At 8:15 p.m. the director was advised by the police and fire units that the last person was out of the area. The director made a personal check of the area and removed some 20 persons who were still on the bridges and along the river.

At approximately 8:15 p.m. the leading edge of the flood arrived south of the city. At some time between 8:30 and 8:45 p.m. the leading crest passed through the city and into Englewood to the north. (According to a report by the Littleton CD director (Disaster Report No. 7), "There was no 'crests' as such passing through Littleton. The width of the river and flood in Littleton was such that the crests that traveled through Sedalia became mere swells through this area.") From the time of this initial wave of slow moving liquid mud and debris being driven by the rampaging water, the level of the flood rose quite rapidly and within 30 minutes had nearly reached its maximum flow. It continued to rise slowly until 12:10 a.m., Thursday, June 17, and then began to recede. The peak flow was later placed at 25 feet above the normal river level and approximately three-quarters of a mile wide. Put another way, the river rose from a normal seasonal flow of 1,000 to 1,200 cubic feet per second to some 40,000 cubic feet per second at peak discharge; 33 to 36 times the usual rate. No recorded flows on the South Platte River had ever equaled that, even in the "Great Flood of 1864" when Cherry Creek had its big floods through the city.

Rising flood waters caused the police to evacuate their headquarters at 2100. Dispatching operations were moved to the fire department, where three dispatchers operated side by side -- one each for fire, police and public works vehicles. The first floor of the fire station was used as an assembly point for volunteers, who started to arrive in large numbers as the flood passed through town. Some 30-40 volunteers were used by the police during the late evening and into Thursday morning. These men were given police armbands, and were assigned to intersections to direct traffic. The police were further assisted by firemen who helped direct traffic and by Arapahoe County sheriff's deputies and a contingent of twenty-five Air National Guardsmen. The latter were not requested by any of the local authorities, but simply appeared shortly before the crest arrived. Working with the sheriff's deputies, these men handled security in the rest of the city, allowing police to concentrate on the flood areas.

During the late evening, Littleton began to organize the necessary post-impact services. Security was maintained by the police and other protective agencies; volunteers were assembled; an Emergency Operations Center was set up at the fire station; public announcements with regard to water rationing, security measures, etc. were made by the city manager; and his assistant arranged for shelters. As morning approached, the CD director set up search parties, using some 150 volunteers; sending one trained person with each 3 or 4 untrained volunteers to comb the damaged areas for casualties. Fire and police representatives, the CD director, the city manager and his assistant and two city councilmen were at the Emergency Operations Center throughout the night.

Several aspects of the Littleton flood effort are of special interest. First, there was a serious spectator problem. Even before the flood waters reached Littleton, large numbers of people gathered at the evacuation perimeter to watch the "disaster of the century." One of the stimuli attracting people to Littleton was the reporting over some area radio and television stations that several interviewees characterized as "irresponsible," i.e., the Belleview Avenue Bridge was reported swept away before the flood waters on Plum Creek had even entered the Platte River some 5 miles upstream. These reports and bulletins began quite early. The Littleton radio station was put out of commission by flood waters shortly after the Platte started to rise in Littleton, and the only stations remaining on the air were operating out of Denver. The highly emotional content of some of these stations added greatly to the spectator problem in Littleton, as hundreds of Denver residents flocked to Littleton to view the spectacle. Some national news media reports circulating at this time were stating that Littleton had been "wiped out." This helped cause a massive telephone overload which severely restricted the different agencies in their attempts to contact individuals and organizations in Englewood, Denver, and other places.

Secondly, evacuating agencies in Littleton reported quite a bit of difficulty in convincing residents that a flood threat did exist. Both the regional history of no disastrous floods and the weather at the time -- it was a clear warm day in the Denver area -- seemed to refute the idea that a flood was imminent. Evacuating personnel stated that residents frequently sought additional confirmation. Police officers went so far as to turn their police radios up to full volume to allow citizens to listen to flood reports being broadcast by the dispatcher at police headquarters.

Before the flood actually struck, there was a problem with spectators arriving on the scene. The seeming lack of concern on the part of many was reflected in the fact that in at least one instance spectators had to be cleared from a bridge that a short time later was swept away. Most people were evacuated from the area at least two hours before the flood waters struck. Some of these people wanted to go back for their personal property and had to be prevented from doing so by the fire department personnel.

After the flood waters began to recede and daylight made some assessment possible, the influx of evacuated persons and voluntary relief workers into the area became a significant problem. Police and National Guard personnel tried as best they could to enforce the security perimeters around the flood damaged

area. Persons were permitted into it if they could show proof that they were residents or volunteer relief people equipped to aid in the rehabilitation operations. In general, proof was in the form of a driver's license or a convincing argument for security personnel.

Thirdly, information concerning the expected flood was sparse and contradictory. The police were warned fairly early, but then had difficulty in securing further information and confirmation. The fire department was not advised of the danger until an hour and a half after the police learned of it. After the initial warnings were received, both organizations had access to a great variety of reports and warnings, but much of this was inaccurate and unreliable, e.g., at 2:30 a.m., Thursday, a warning of another crest was aired by the Colorado State Police. By the time the Littleton CD director, who was at the time inspecting flood damage upstream from Littleton, was able to inform the Littleton authorities that the report was unfounded, both police and fire departments had started to evacuate additional areas and the city was preparing for another onslaught.

A fourth interesting thing about Littleton was the fact that the civil defense director had directed a "mock flood" simulation one year before the floods actually hit. Police, fire, public works, and other city officials participated in this exercise, and all cited it as structuring their actions in the real flood. The mechanics of the evacuation were taken directly from the practice (a real division between fire and police, perimeter control, etc.); the use of the fire station as an emergency operations center; coordination of fire, police, civil defense, and city manager's office; all followed the basic plan worked out a year before. While no fully written plan was disseminated to all divisions of the city government, strategically positioned people in each department were aware of the general plan of action, and it was seen as a guide, rather than a hard-and-fast plan of detailed activity.

Englewood (Arapahoe County)

Englewood, with a population of 33,393 (1960), is one and a half times as populous a community as Littleton and 60 percent larger in terms of area. Englewood is a suburb of its northern neighbor, Denver, and was populated earlier than Littleton, its neighbor to the south. The South Platte River flows through a relatively small sector of town, and so with respect to both area and number of people threatened by the flood, Englewood was not as involved as Littleton.

Englewood is governed by a city-manager form of government. The city manager was out of town at the time the warning was received concerning the flood and he returned immediately. The police department consists of forty-two people. The staff includes a chief, an assistant chief, two lieutenants, a sergeant of detectives, four detectives, the patrol division with four units of one sergeant and six officers in each unit, two parking maids, two clerks, and one dog warden. The department has a total of thirty-one officers with a sergeant and six officers making up a shift. During the day, in addition to the regular shift, the chief, assistant chief, and two lieutenants are one duty. The chief was out of town when word was received concerning

the flood and he returned immediately. The department has its own radio communications. There is a base dispatching unit and all cars have mobile units.

The fire department has a complement of thirty-two paid professionals and fifty-two volunteers. There are two captains and six lieutenants among the thirty-two professionals, and two captains and two lieutenants among the volunteers. A normal shift consists of twelve men. There are five stations. The fire department has its own radio communications. The chief also has a radio by which he sometimes monitors the police department. During the disaster a helicopter crew was reporting into the sheriff's office about the progress of the flood. The police were monitoring the sheriff's office, and the fire department was monitoring the police.

The first warning received by any organization in Englewood was at 5:00 p.m., Wednesday, June 16, when the Arapahoe County sheriff's department notified the police that a 20 foot crest was coming down the South Platte River. Both the sheriff's department and the Colorado State Patrol urged the police to evacuate low areas along the river. The Englewood department did not notify other municipalities nor the local fire department because it was assumed they were getting the reports from the Arapahoe County sheriff's office and the Colorado State Patrol the same as the police. The department did, however, notify other local agencies such as streets and roads, water, and utility; and word was sent to the city manager and department heads that were out of town.

The police called their auxiliary to duty and immediately send officers from door to door along the east side of the river. Sheridan, an incorporated community of 3,559 (1960) that borders Englewood on the west, was aided in evacuation by Englewood police. Sheridan has its own police department and its own communications system. During the disaster Sheridan, Englewood, Littleton, and the sheriff's department "had jurisdiction anywhere in the county and paid no attention to city limit lines or anything like that" (respondent). Within Englewood there were approximately 400 families evacuated and "quite a few" families in Sheridan.

The fire department was alerted by the Arapahoe County sheriff's office by 6:00 p.m. Volunteer and off-duty firemen were called to the station where some of them remained on stand-by duty to maintain fire protection while another group was sent into the field to work with the police in evacuation. The civil defense director was notified by the fire department and he called in a group of about twelve men, most of whom were kept in reserve in one of the fire stations for whatever emergency might arise and whatever assistance they might give. A few civil defense volunteers were assigned individually to work with the police and fire departments in helping with evacuation. In addition to the auxiliary police, volunteer firemen, and civil defense workers, there were just plain volunteers that came in and were used as needed. Fire department evacuations included both door-to-door alerts and the use of loudspeakers on the fire trucks.

The police and fire departments did not have a problem with confirmation. The fact that the alert came from the Arapahoe County sheriff's office lent enough authority that both these departments went into action immediately.

Time was more than adequate for evacuation, and the civil defense director and a captain of the fire department were able to make a survey of the evacuated area before the flood. The crest actually came through at 8:30 or 9:00 p.m. Wednesday. By the time the crest reached Englewood the evacuation had been completed. About 2:00-3:00 a.m. Thursday there were reports of another crest that never materialized. Between the first flood and the report of a second some people had gone back into the danger area. The police evacuated these people again, but it was not nearly the sizeable task this time that it had been the first time. Most of the area was under water, and thus, residents had not re-entered in large numbers.

While most residents in the threatened area accepted the evacuation warnings readily enough, a sizeable minority was quite reluctant to leave. Many people simply refused to believe that the Platte could flood. The last really "big flood" was in 1933. Evacuating agencies in Englewood faced a spectator problem very similar to that which existed in Littleton. Mass media reports of the impending flood drew large numbers of people from Denver to Englewood. These spectators seriously hampered the evacuation efforts, and as the flood crest drew near, the police finally had to remove a number of spectators forcibly from bridges across the Platte. Evacuation in Englewood, proceeding under the twin difficulties of resident disbelief and traffic congestion caused by masses of spectators, was completed just before the crest arrived. About 9:30 p.m. Wednesday the rising water caused a general power outage which also cut off police and fire communications. These remained out for twenty to thirty minutes, at which time the fire department emergency generator was connected. This supplied power for both organizations during the night.

After the flood, the police set up perimeter control. The police patrols were supplemented by a detachment of about 145 National Guardsmen from the local armory. The National Guard was used by the Sheridan, Englewood, and Littleton Police and the Arapahoe sheriff. They presented themselves on a voluntary basis and worked around the clock on a volunteer basis until Sunday, June 20, when they were called to service officially when the governor activated the Colorado National Guard. The patrols were used throughout the city because of the potential problems presented by the power failure, in order to keep looters out, to keep home owners out until it was safe, to keep curiosity seekers away, and to reroute traffic. The police reported only a few cases of looting; looting was not a problem. Traffic did present a problem. On Thursday one bridge was opened, and that was the only bridge across the river in the entire county. It was the only one into Denver as far north as Colfax Avenue. Permits were offered to various people who worked within the perimeter.

Interorganizational problems were at a minimum in Englewood, largely because of the fact that two agencies, police and fire departments, carried most of the pre-flood efforts. The city civil defense director aided these agencies to some extent. The police did notify other municipal departments, but these agencies concentrated their efforts on protecting their own equipment and facilities. The city manager was in Estes Park, along with the chief of police and the city engineer when the first warnings were received. They were notified by the police dispatcher, and the police chief and city manager returned immediately to Englewood, arriving just before the flood. The city engineer arrived at 2:00 a.m. Thursday.

A number of similarities may be observed between Englewood and Littleton. (1) They are both Suburban Denver. (2) The South Platte River flows through Littleton and then through Englewood. (3) A serious spectator problem, complicated by extravagant mass media reports, was present in both. (4) There was difficulty in persuading some residents of the seriousness and genuineness of the threat. (5) A number of reports received about the flood were not accurate, and this led to an additional evacuation in each community that was unnecessary. (6) A number of key officials in both communities were out of town at conferences. (7) While the leaders of both communities learned from the experience and are aware of changes that might prove beneficial in a recurrence, the aforementioned problems were handled with reasonable success in both communities.

Denver (Denver County)

Denver, a city of approximately 500,000 (493,887 -- 1960 census; 529,800 -- estimated 1964) is the political and cultural capital of Colorado. It is the largest city in a state of 1,753,947 (1960 census) and has more than five times the population of the second largest city, Pueblo. Metropolitan Denver includes four counties and has a population of 1,075,500. Offices of the Colorado State Patrol and the Colorado Office of Civil Defense, along with almost all other state offices are located in the city. Denver is known as the "Mile High City" because of its elevation of 5,280 feet. Ironically, it is also called "the climate capital of the world" because of an average of 333 days of sunshine annually. In the spring of 1965 eastern Colorado had been drought ridden for three years and just six months before the flood it had been named a distress area. During the month of May the rain was present every day and people began joking about the "monsoon" season. The mountains were heavy with snow and the streams were heavy with water from the May rains. The people of Denver, on the eastern slopes of the Rocky Mountains, were not concerned. The rather unusual appearance (for this region) of tornadoes, added the trigger that set off the worst flood Denver has ever known.

Denver is ruled by a mayor-council system. The police force consisted of 801 people. The fire department had a complement of 670, divided into six districts (battalions) each with a district chief. There are from three to six fire houses and from four to nine companies in each district. Both the police and fire departments are elaborately equipped and operate under civil service regulations.

Although Littleton was warned of impending flood by 3:00 p.m. on Wednesday, and had confirmed the report by 3:30 p.m., the first indication the Denver police had of any possible danger was at 5:00 p.m. when the police radio room picked up a Colorado State Patrol call concerning the Plum Creek flood. The Denver CD director, who was at a meeting in Estes Park, learned of the situation at 3:00 p.m. when the governor announced, in the middle of a speech, that a tornado had struck Palmer Lake. The director returned immediately to Denver, a 60 mile drive, but notified no one else until about 5:00 p.m. At that time he contacted the Arapahoe County CD director, and in learning more about the situation, decided to set up the CD Emergency Operations Center in the basement of the City and County Building. The Emergency Operations Center was planned as a coordination center for the various city agencies

with one representative from fire, police, public works, and other agencies intended to participate in it in order to effect more rapid and efficient coordination.

The Denver police radio room picked up a Colorado State Patrol call concerning the Pluma Creek flood at 5:00 p.m. By 6:00 p.m. the patrol division chief of the Denver police had been notified and had ordered all auxiliary patrolmen to report for assignment. He also ordered that all low-lying areas be evacuated immediately and began setting up a field command post on a strategic bluff above the river. The patrol division chief took charge of this post, and men were dispatched from it rather than the downtown headquarters. Five other command posts were set up as the evening progressed. Captains were in charge of these posts and they dispersed men in their areas as needed. Policemen were sent into the expected flood area from all sections of town, and skeleton crews were left in the rest of the city. The fact that the shift change normally occurs at 7:00 p.m. allowed the police department to hold over a shift, thereby nearly doubling the number of men available. Part of the police department was assigned the task of evacuation. Some officers were assigned to warn residents on a door-to-door basis. Bullhorns and loudspeakers on patrol cars were utilized, and in some instances, the police actually transported people out of the area. Other officers were assigned to traffic-control duty around the perimeter of the area which was being evacuated. An effort was made to prevent movement into the area. The cordon was not completed until later in the evening. The police were aided in the task of traffic control by an auxiliary force of 200 to 300 men. Some of these men were regular auxiliary policemen, and others were volunteers off the street. When the police personnel saw that the men were handling the problem, they left them alone and devoted their attention to other tasks. Extra traffic control was made even more important by the fact that the traffic-light system for much of the city was off much of the time from 10:30 p.m. Wednesday to 6:00 a.m. Thursday.

The Denver fire department began to pick up sketchy information on the probability of a flood about 6:00 p.m. The information came from the Colorado State Patrol. The department normally operates with two dispatchers, and others are available in case of emergency. The two dispatchers on duty when the information concerning a possible flood was picked up at 6:00 p.m. called the communications chief, who was in the building, and told him that they had information of a very sketchy nature. They called him again at 6:30 p.m. and said that it definitely looked as though a flood was coming. The communications chief went to the dispatching room immediately. An off-duty dispatcher volunteered to help and also came into the room. In addition to these men, the district fire chief, whose quarters were only four or five blocks away, came in with his driver. This meant that there were six men on duty at the time. All the communication for the fire department were centered in one main headquarters. There are six incoming-emergency lines plus five business lines on the switchboard. In addition to this, there is a telephone to each fire house and a "vocal alarm" (public address system) to each fire house which can be used to call either all of the houses at once or selected houses. There are also alarm circuits to the houses and street boxes to use for reporting. Every piece of equipment has a two-way radio. Even though power was lost on three occasions, a standby natural-gas-driven generator took over immediately so that there was never an outage in the communications system.

The fire department chief was notified that the flood was a definite threat at the same time (6:30 p.m.) as the communications chief. The department chief ordered the department to go to a "stand-by" basis. The chief then drove to the police command post which was just being set up on the river, and conferred with several different command officers; thus the plans of the two departments were coordinated. The communications center received further information from Littleton and Englewood concerning the impending flood, and after some difficulty, contacted the Denver fire department chief in the field and advised him of this new information. Acting upon this latest knowledge, as well as that which he had obtained at the police command post, the chief ordered the fire department to start evacuating areas within 1,000 feet of the South Platte River. Fire personnel also combed commercial establishments along the river, checking for the possibility of gas, poison, or any other potentially dangerous material that might be washed away in the flood.

By 5:30 p.m. the Denver CD director was at the Emergency Operations Center setting up the civil defense operation. Civil defense saw its role chiefly as one of coordination. According to prior plans all city department heads were to report to civil defense and the Emergency Operations Center, but this did not materialize. During the course of the evening, the public works manager and two or three of his men came by the center, but since they were not needed at the time, they left -- leaving word as to where they could be found until 11:00 p.m. The manager of welfare also came, and the director gave him a report on the activities of the American Red Cross with whom civil defense had been working in setting up shelters. No other department heads showed up.

By 8:30 p.m. CD was suffering from a serious lack of information, both regarding the flood crest and concerning the activities of other city agencies. The director requested four mobile units to go into the field on both sides of the river -- two to check on evacuation, and two to follow the flood crest. These units, which consisted of RACES (radio group) men in personal cars, gave CD a fairly good picture of the evacuation activities and the flood crest. In addition to this, CD personnel were monitoring the Colorado State Patrol radio transmissions.

The Denver Red Cross was busy setting up evacuation centers. The first word of possible flood came at 5:00 p.m. when a "friend" at one of the local radio stations called about the impending flood. The assistant manager immediately called the Colorado State Patrol and verified the information. He then alerted the staff and people returned to the office. Within three hours 300 volunteers showed up. The first operation, after notifying staff personnel, was to alert the canteen services so that they could prepare to serve the shelters that were being set up. Seventeen shelters were set up within two-and-one-half hours. Ten of these were closed on Thursday because of lack of need. Some shelters were set up at predetermined sites and others were improvised where supplies could be obtained. These shelters held a maximum total of 1,600 people at one time. Radio communication was maintained with each shelter by means of amateur radio volunteers. One police officer was requested for each shelter and some were received, but not enough to assign one in each shelter. According to plan, civil defense worked with the Red Cross on the project. Telephone conversations were carried on five

or six times throughout the night. Other city agencies, if they had been at the Emergency Operations Center, would also have been aware of the location of the centers. Instructions concerning the location and use of these shelters could then have been given to people being evacuated.

The evacuation was begun at 6:00 p.m. and the first real flood water did not reach the city limits until 9:30 p.m.; it rose in the downtown area at 10:00 p.m. and forced the electric company to shut down at 11:00 p.m. The flood covered an area 30 blocks long, and varied from one or two blocks on each side, to five or six blocks on each side. Unofficially, the police estimated that nearly 2,000 families were evacuated by their department alone, and 3,769 families were evacuated in the metropolitan area. While there was no "wall of water," the flood did frequently back up behind bridges as it moved through the city. Because of all the debris in the water that had been picked up as the river passed through Littleton and Englewood, the water was partially dammed at each bridge, and as the bridge collapsed a rush of water and debris proceeded downstream.

As the flood reached its height and began to recede, the fire department moved into search-and-rescue work, assisting spectators and others who had been missed in the evacuation, or who had slipped through the cordons and been stranded by the rising water. Having completed evacuation, the police were able to devote more time to tightening their perimeter control and directing traffic. The traffic problem was hampered by the power failure that meant traffic lights were not operational. Not long after midnight, however, the curious began leaving the area to return home. About 1:00 a.m. Thursday 09 National Guard troops were sent into Denver, and by 6:00 a.m. there were approximately 300 self-sufficient troops assisting the police with traffic and security work. These troops were secured by the state CD; the adjutant general is also the state CD director.

A number of problem areas may be observed in viewing the Denver situation. As was the case in so many communities, the city agencies had a great deal of difficulty in obtaining information and even more difficulty in confirming its accuracy and interpreting it. Both the police and fire communication centers were heavily overloaded with calls from residents who wanted all kinds of information about the flood. The Denver CD had an informational problem similar to that of other agencies and this was complicated by the fact that civil defense saw its main role to be that of coordination. The director was unable to contact most of the municipal agencies that civil defense was to coordinate. The task of communication was made difficult because CD had no radio contact with the police or fire departments; the high ranking officers in these departments were in the field, at command posts; and representatives of other agencies were not at the Emergency Operations Center.

Another informational problem was the early-morning-hour alert to both the police and fire departments concerning an additional crest. No evacuation seems to have taken place as a result of this alert, but several men were dispatched to verify the alert. It was several hours before either agency could be sure that there was no danger of another crest on the river.

The task of evacuation presented a number of difficulties that had to be overcome. First, both fire and police personnel had difficulty in convincing

residents that the threat was real. The problem of lack of belief seems to have been more acute in Denver than in any other community. People frequently refused to believe that a flood was possible in Denver, much less that it was imminent. Some residents had to be forcibly evacuated two or three times. Police and fire personnel were forced to patrol areas that had been evacuated and to remove people who had filtered back into the evacuated zones. Spectators created the second problem. These people flocked to the river from all over the city, having been apprised of the situation via commercial radio broadcasts. This led to a tremendous traffic-control problem, and made the establishment of perimeter control more difficult. These people, like many of the evacuees, did not seem to realize the danger. They had to be cleared from bridges and to be restrained behind barriers. A third factor may have complicated the evacuation. Evacuees were not directed to any specific place, but were told simply to go to "high ground." It appears that this helped to lead to the concentration of large numbers of evacuees and spectators in the areas immediately outside the evacuation zone, thereby complicating perimeter control and adding to the traffic snarl. In addition to the above problems which were common to many communities, there was the additional problem in Denver of breakdown in interorganizational communication within the city.

Brighton (Adams County)

Brighton, a community of about 3,500 (estimated 1965: 7,055, 1960 census) 20 miles north of Denver in the extreme northern part of Adams County, serves as the county seat. It is primarily a farming community. It has its own police and fire departments. The police department is made up of a chief, a captain, a sergeant, six patrolmen, an animal warden, and a secretary. The Adams County sheriff's department handles law enforcement outside the incorporated areas of the county. The department is rather well equipped for communications: its radio dispatcher's office, located in Brighton, has two channels for broadcasting, one for the department and the Commerce City police department; and the other for use by the Colorado State Patrol, the Thornton, and the Westminster police departments. The sheriff's department also had teletype communications with all of the other metropolitan Denver sheriff's departments, and most of the local police departments, plus several others from Cheyenne, Wyoming, to Colorado Springs, Colorado. There is also direct radio communication with all of the Adams County fire units, two telephone lines to receive fire calls, and ten regular telephone lines into the sheriff's department.

Neither Adams County in general, nor Brighton in particular, has had any extensive amount of flood experience. The South Platte River is the only major river or stream in the county, although several smaller streams -- some of which flooded during this disaster -- are located in the eastern part of Adams County. The first indication of possible flood danger in Adams County came at 3:00 p.m. Wednesday when two sheriff's deputies notified headquarters that they were being chased by a tornado on U.S. Highway 6 just south of Barr Lake. After responding to the call, the sheriff and undersheriff were advised that a call had been received by headquarters from a resident from just east of Aurora, a suburb contiguous to the eastern limits of Denver, who reported flooding from heavy runoff. The sheriff ordered all available men to the area to help, and headed that way himself. Upon his arrival he found "the best dressed crew of sandbaggers" he had ever seen. Several sheriff's department

investigators and others from various offices, uniformed Adams County patrolmen, and Army personnel from Fitzsimmons Hospital were busy filling burlap sacks in a driving rain. The rain suddenly ceased, the immediate danger passed, and the sheriff's men started to leave to change their soaked and dirty clothes. At this point reports of flooded creeks started to come in. At 7:05 p.m. a report was received concerning flooding on Sand Creek and Tollgate Creek, just east of Aurora. Cars were immediately dispatched to check the bridges and lowland areas near them, and to warn of impending washouts, floods, or other dangerous situations. They were also to warn residents in the area and to help them to evacuate when necessary. Deputies took stations at several points, and several units started warning occupants of a trailer court which was situated on the very banks of Tollgate Creek. Just as the last evacuees had left, the water struck. Some of the trailers were washed away and gas lines were broken, causing a fire hazard. A fire unit from the Altura-Sable Volunteer Fire Department arrived to stand by.

At 6:00 p.m. the volume of calls to the sheriff's department was surpassing the capacity of the regular dispatchers. Extra men came into help handle the steady barrage of calls, reporting damage and requesting cars, men, ambulances, fire units, information, and general assistance. At 7:00 p.m. the sheriff's department called all reserves to duty and the men were then sent along Sand and Tollgate Creeks to guard bridges and to warn residents of the danger.

By 7:00 p.m. the Brighton Police Department learned that the South Platte River would present a threat. At this point the Brighton CD director urged that those people who were living along the Platte be evacuated. After hurried consultation, the evacuation was begun, with the police going from door-to-door, a fire truck with a public address system cruising the streets, and the civil defense director assisting both organizations whenever possible. The American Legion, as well as several private homeowners, offered shelter. Using this information, the police and fire personnel told people what was coming, what authorities recommended they do, and where they might find lodging. The evacuation seemed to take on more of a communal nature in Brighton than in other towns. Callers offered shelter and officials were offered help by numerous volunteers, including members of a local "hot-rod" club who used their vehicles to move house trailers from a court in Weld County, just north of town. Some seventy-five people, in both official and volunteer capacities, helped to assist people from their homes. About eighty families were evacuated in Brighton, plus others to the north and south of the city limits.

While the Brighton evacuation was proceeding fairly smoothly, the Adams County sheriff's department was having several problems. Shortly after 7:00 p.m. the sheriff's dispatcher lost contact with the Colorado State Patrol, thus limiting the availability of information. Nearly all of the deputies were busy in the area east of Aurora, evacuating people along the smaller streams and closing roads where bridges were impassable when word was received that the Platte crest was moving into Denver and would be in Adams County shortly. Men were shifted, as they became available, to the vicinity of the Platte, and reserves were sent into the area to start evacuation. By 9:00 p.m. all reserves were dispatched to the field and were thus out of contact with headquarters, since they had no radios in their vehicles.

A "wall of water" or "Severe Crest" never actually hit Brighton, but the severe rise of water did hit the community at 9:30 a.m. Thursday. By 11:00 a.m. Thursday, the waters of the Platte started to recede. Little actual damage occurred in Brighton, and the damage which did happen in Adams County was primarily to property, especially to farms, equipment, and livestock. An exception to this was an Altura-Sable volunteer fireman who was injured by a falling power line. In Brighton, the police organized special patrols to protect evacuated areas from possible looting, even as people were being evacuated. In the county, security patrols were not established until after the crest had passed through, and at least one member of the sheriff's department reported that looting did occur, despite the fact that no arrests were reported. The most significant problem faced by the sheriff's department was that of too few men and too large an area to be covered. This situation, incidentally, was not resolved with the passing of the Platte crest, for the sheriff's department had no more started to relax when Beaver and Bijou Creeks in the far eastern sector of the county began to flood. Deputies spent a major part of Thursday working in these areas evacuating endangered residents.

Brighton, and Adams County in general, faced three problems that were common to most communities experiencing these floods. First, in Brighton and Adams County in general, there was a lack of complete and accurate information concerning the floods themselves. This was not only true for flash floods and run-offs, but also for the flood on the South Platte River. Three or more crests were reported to be coming, one of them reported to be 40 feet high. When the crest finally did arrive on Thursday it was the only one, and it was a rise in water rather than a wall of water. A second problem in Brighton was that of people refusing to leave their homes. In these cases the police did not forcibly remove people, but urged them to go, and advised them of the danger that they were in. Despite repeated warnings, several people remained in their dwellings and had to be evacuated by boat after the water rose. Finally, there was some problem with spectators along the Platte, but this was not of the magnitude experienced in many other communities. Two matters of special note in Brighton and Adams County are the high degree of interagency coordination and the large part played by volunteers. In Brighton, the public played a larger role in the warning process and evacuation than was the case elsewhere.

Greeley (Weld County)

Greeley, a community of 26,314 (1960 census), is the county seat of Weld County. Its culture is primarily oriented toward agriculture. Both the Cache La Poudre River and the South Platte River flow through parts of town, and the Cache La Poudre unites with the South Platte just east of the city. While Greeley experienced virtually no damage from the South Platte River flood, several of the responsible agencies were forced to prepare for a flood, and the picture generated by this preparation is a most interesting one.

Greeley has a total of 187 city employees. Of this number the police department accounts for 48. There is a chief, an assistant chief, 2 lieutenants, 4 sergeants, 36 officers, and 4 women. There is a police auxiliary of 22 members. The department maintains 8 cars and 3 motorcycles. The fire department has a complement of 31 paid men. There are 2 fire houses and 4 companies with 4 lieutenants, each in charge of a company.

There is not a Greeley Office of Civil Defense as such, but various city employees serve in different civil defense roles. The chief of the fire department was also serving as director of civil defense.

Greeley has a radio band which is common to the police, fire and public works departments. The police and fire department vehicles have radios. The police department monitors the sheriff's radio, and there is NORAD to Denver, Pueblo, and other places.

On Tuesday, June 15, the Greeley office of the Colorado State Patrol spent the larger part of the day in the Loveland and Rockport areas, north and west of Greeley, covering tornado and flood damage along several small creeks. A local news reporter warned the Greeley Police Department that the Poudre River to the north of town was rising, and the police initiated periodic checks on it. On Wednesday the police notified a number of people who were living outside the city limits that the Poudre might flood, and evacuees began to filter into town and congregate at the police station. Housing for them was arranged through the local Red Cross. That evening the police department called in a part of its reserve force.

At 7:45 p.m. Wednesday the local civil defense director-fire chief received a call from the state civil defense in Denver, warning him that the Platte River would flood the Greeley area within three hours. The chief notified the police, both local radio stations, the county civil defense director, and other agencies. Shortly after this, the radio stations broadcast the flood forecast, and personnel from the fire department, police department, state patrol, and Weld County sheriff's department began patrolling the Platte Valley -- watching for the expected crest. Despite the fact that the city was threatened from two different directions, the situation was not deemed to be greatly dangerous, and the police chief left to attend a meeting at Estes Park that evening -- remaining out of town until Saturday.

The county civil defense director was contacted by the fire chief at 9:00 p.m. and advised that a crest was expected on the Platte that same evening. The county director stayed home and watched television, seeking confirmation of this news. After deciding that it was a valid warning, he called several local civil defense directors in the county, but all were aware of the situation, so he decided the best strategy was to sit and wait.

Beginning at 9:30 p.m. the fire chief-civil defense director started to receive additional calls from the state civil defense in Denver. All of these calls had essentially the same message: "Expect the crest in three hours." Sometime before midnight the fire chief determined, via other sources, that the crest was actually still south of Brighton, and that it would not arrive for some time. During this same time-period, the state patrol's Greeley division was confronting similar problems of reliability. Its information, however, was a bit more reliable because of the patrol's microwave network which allowed prompt and direct communication with the Denver division. All of the agencies involved received a multitude of calls from other regions of the state and from the general public, both reporting (with varying degrees of accuracy) and requesting information.

The fire and police departments cooperated in evacuating some thirty to fifty people along the Poudre, beginning at 11:00 p.m. Bridges along that river were barricaded, and an attempt was made to keep debris cleaned off of them. The Poudre

actually crested between 2:00 and 3:00 a.m. Thursday, covering approximately a six-block area, and damaging some twenty-five to thirty houses.

Throughout the night, and during Thursday, the patrols along the Platte were continued, and as the crest neared Greeley, the accuracy of reports obtained by the fire, police, and sheriff's departments improved. As Thursday morning passed, it became evident that there would be no major flood from the Platte and no evacuation orders were issued. The Platte crest moved through Greeley after noon on Thursday and flooded many acres of farmland, but did no appreciable damage within the city limits of Greeley.

As with all the other communities faced with flooding, Greeley faced a number of problems. First, as was the case in every flood, the lack of accurate official information was a handicap to warning and response. Various officials worried also about the effect that "broadcasting of unfounded rumor by some radio stations in Denver" would have on the populace.

Secondly, a certain amount of difficulty was encountered in people who did not believe the evacuation warnings. Because of this, attempts to remove residents from endangered areas prior to the flood were only moderately successful. In a few cases the evacuating agency simply let the residents remain in their homes until the water started to flow through their houses, at which time the people evidenced more willingness to leave and the evacuation was effected. This was possible because the water did not hit in the form of a rapid and severe crest as was the case in some communities.

Thirdly, sightseers presented some problems. Looting was not a problem, and only one case, in Loveland, was reported in the county.

Interorganizational coordination in Greeley and Weld County was quite complete. The police and fire departments are in the same building and operate on the same radio frequency. Although there was overlap in patrolling the Platte River, personnel from the several organizations seemed to share similar ideas as to the proper function and role of each in the warning process. In no instance was there conflict of jurisdiction. The Colorado State Patrol and the sheriff's department covered rural areas and the municipal police and fire departments cooperated within the city limits.

One point which stands in vivid contrast to other areas of the state is the very calm and unruffled manner in which the police and fire departments and the county civil defense went about preparing for the flood. Although the police auxiliary was called to duty, regular shifts were maintained at all times. The police chief felt secure enough in the preparations for the flood that he left town for a scheduled conference. In a similar fashion, the county civil defense director, after listening to television and deciding that there was real danger of flooding, checked with his local directors and settled back to wait.

Group II. Area II (Arkansas River, Southeast Quadrant)

Pueblo (Pueblo County)

Pueblo, Colorado's second largest city, with a population of 91,181 (1960 census), sits at the junction of the Arkansas River and Fountain Creek one hundred and twelve miles south of Denver and forty-three miles south of Colorado Springs. Pueblo, as was the case with the smaller communities downstream on the Arkansas River, has had a flood history. Floods have not however, struck with the repetitiveness that has led some river communities in the east to develop established routines of response among various agencies and the general populace.

Pueblo has a city council-city manager form of home rule government. The police department had 138 employees in 1965. The police department shares a radio frequency with the Pueblo County sheriff's office and there is some monitoring between the police and fire departments. Besides the possibility of monitoring each other, which is sometimes done, there is a direct telephone line between the Pueblo police and fire departments. The Pueblo Fire Department has 128 employees, with approximately 59 men on a shift. The fire department has four means of communication within the department: telephone, fire alarm system, radio and an enunciator system between stations. All motorized vehicles are radio equipped. There is no volunteer system; for additional help, the department depends upon callback of its own men.

The Office of Civil Defense is a county agency by law in Pueblo County, and the city of Pueblo participates in the agency both financially and program-wise. The director is director of the county, but he has always served as director of the municipalities within the county as well. There is no separate city civil defense agency. CD at the time of the flood included six people: the director, deputy director, administrative assistant, store keeper, general handyman, and clerk. The communications man is a volunteer who is an employee of the state hospital, and the hospital has made him readily available in case of disaster. Pueblo County CD saw its job as mainly one of coordination based on communication and warning. The director viewed the flood in terms of preflood, flood, and post-flood activity. The preflood period was devoted almost entirely to setting up a central communications center so that information could be given out to both the city and county officials. A Disaster Preparedness Committee was set up in 1956; and while it was not functioning as a formal committee in 1965, it had set up an "Operations Plan" that was still in existence.

On Wednesday, June 16, the Pueblo Division of the Colorado State Patrol was active in the Palmer Lake area south of Denver, assisting the Denver Division in the areas stricken by a tornado. The Pueblo city manager was attending the Estes Park meetings, and the civil defense director was in Littleton, returning from a trip to South Dakota. The civil defense director was able to watch the Platte flood strike the Denver area before leaving Denver for Pueblo on Thursday morning.

In Pueblo, other civil defense personnel had begun flood preparations early Thursday. About noon, mobile units were sent upstream to keep watch on Fountain Creek and to report back to civil defense on its progress. Some of the Pueblo County road commissioner's men were also doing the same thing. Both of these

Figure 3: Chronological Outline of Group II, Area II
 (Southeast Quadrant) Wednesday June 16
 through Friday June 18

	Pueblo (Pueblo Co.)	La Junta (Otero Co.)	Las Animas (Bent Co.)	Lamar (Prowers Co.)
Alert Received by Official Organization	Wed. day- time	Thurs. shortly after Wed. midnight	Thurs. day- time	Fri. shortly after Thurs. midnight
Alert Confirmed by Official Organization	Thurs. aft.	"	Fri. morning	"
Alert Broad- cast to Other Organizations	Thurs. 2:48pm	Thurs. 12:01am- 3:00am	none	"
Alert Broad- Cast to the Public	Thurs. 3:00pm	Thurs. 3:00am	Fri. morning	Fri. early morning
Crest Strikes	Thurs. 9:30pm	Thurs. 11:00am	Sat. aft.	Fri. before 4:00am
Subsequent Crest Strikes	none	Fri. 8:00am	none	Arkansas River 8:30am

groups were working independently, both having been dispatched on the basis of mass media reports of heavy rain and flooding near the headwaters of Fountain Creek north of Pueblo. Neither organization had received any specific flood forecast at this point.

At 2:48 p.m. on Thursday, civil defense notified the assistant city manager that high water could be expected in Pueblo. By monitoring each other's radio traffic, civil defense and the county roads department had become aware of the fact that each was patrolling the Fountain. At this time flood preparations began to take on a more serious air, with civil defense removing much of its equipment and emergency supplies from a warehouse along the river, and the assistant city manager notifying the police and fire departments.

During the early afternoon the Colorado State Patrol and the Pueblo County sheriff's department were busy outside the city limits, setting up river watches and checking roads for washouts. By 3:00 p.m. the sheriff's men began to warn people who were living along the Fountain. In these areas the response to the warnings was good, and the sheriff's department received many offers of help from volunteers who wished to assist in the evacuation. At this same time civil defense contacted the Pueblo fire department and requested help with their ham radio operation. The fire chief dispatched one of the assistant chiefs to civil defense for this purpose, and the river watch continued.

The civil defense director arrived in Pueblo from Denver at 4:35 p.m., and confirmed the flood warnings which civil defense had already obtained. Acting upon this information, and a report from the state patrol that the crest had just crossed into Pueblo County, civil defense began to issue evacuation warnings to city departments and to radio and television stations. The sheriff's department had already evacuated along the Fountain for 12 miles north, and the county roads department had also notified a number of residents of the probable danger, evacuated about fifty people, and had moved much of the county's road equipment to high ground.

The Pueblo Police Department initiated evacuation within the city limits at 5:30 p.m., using loudspeakers and word of mouth to urge people to leave low-lying areas. Beginning at 6:15 p.m. the police were assisted by fire department personnel; the firemen, however, concentrated on handling the particularly difficult evacuations and did not become very active until the crest reached the city. For the most part, evacuees were simply told to "go to high ground." About 300 to 400 homes (500 to 600 people) and two or three times that many businesses were evacuated in the city. The Red Cross shelter handled approximately 300 people. The crest actually struck Pueblo about 9:30 p.m. Thursday.

A number of problems faced in Pueblo were similar to those in the other communities studied. First, accurate and dependable information was scarce. During the hours between 5:30 and 9:30 p.m. rumors and false reports reached a peak. Some of these reports come from mass media and other discrepancies may have been due, in some part, to the fact that a number of different agencies were sending in independent reports with little or no knowledge of each other's work. These rumors, which consisted of reports that dams had broken, that more crests were to follow the original one, and the like, continued on after the flood started to recede and caused civil defense, police, and other agencies a great deal of trouble. The

county road commission, for example, after the crest had started to drop, moved its heavy equipment back to lower ground, and then re-evacuated it for a total of three times in response to false reports of further crest conditions. Unreliable and contradictory reports also contributed to ambiguous evacuation warnings which were sometimes given to the populace.

Secondly, evacuation, both within and outside the city limits was severely hampered by large numbers of sightseers who flocked to the river to watch. The police department delayed the closing of streets as long as possible, in an effort to minimize congestion, and tried to allow spectators as much freedom as was feasible. The same general course of action was taken by the sheriff, who tried to keep the expected arrival time of the crest from the public in the hope that people would come to the river to watch, see that there was no flood yet, and leave.

There are a number of other responses that are worthy of note. First, it may be noted that the various agencies in Pueblo were amply equipped with staff and equipment to facilitate interagency communication and coordination. However, a high degree of communication and coordination did not seem to develop. The assistant city manager worked closely with civil defense during the afternoon, and with the fire department during the evening, but as far as is ascertainable, directed no action at any time. Although civil defense was aware of the potential flood before noon, the police and fire departments were not advised of this until 3:00 p.m., and they took no action until 5:30 p.m. when they had received a second, very firm alert from civil defense.

Secondly, there seemed to be a hesitancy in the response of various organizations until after the crest had struck. Civil defense waited two and one-half hours, until a second firm warning was received before notifying the police and fire departments. The fire department, after it had accepted the validity of the warnings, attempted to leave evacuation to the police, and kept its own forces in reserve for fire or rescue work. The police department did not close the streets until absolutely necessary. Spectators were left free in evacuation and flood areas, and reserves were called only after the flood had hit. As late as midnight on Thursday, when police forces were regrouped, men who were sent to damaged areas were simply told to "help people and keep those with no business there out of the area." This lack of an overall plan and direction resulted in massive congestion along the Fountain Creek on Friday morning. Cleanup operations, large numbers of spectators, and residents trying to salvage belongings, all combined to produce complex traffic snarls. When a civil defense representative and the fire chief suggested setting up a pass system for the area, the police opposed the idea, feeling it would cause more trouble than it would be worth.

La Junta (Otero County)

La Junta, with a population of 8,026 (1960 census), is the county seat of Otero County. Like many other communities along the Arkansas River it is primarily oriented toward agriculture. La Junta has a flood history much like that of its neighbor, Las Animas, 20 miles downstream. La Junta's city manager, who had been at the Estes Park meeting, arrived at 5:15 p.m. on Thursday.

The community has a superintendent of public safety who is responsible for both the police and the fire departments. The police department consists of eight men and one woman. They are captain, three sergeants, four patrolmen, and a clerk-dispatcher (the woman). In addition to these paid personnel there are twelve auxiliary police who maintain their own organization. The captain was on vacation, but the superintendent called him back to duty on Thursday so that the superintendent could devote his attention to the fire department, some of whose personnel were at the fire convention in Cortez. A sergeant from the Strategic Air Command contingent at the local airfield called and asked the superintendent if help was needed, and when he was answered in the affirmative, six men were sent who were used by the local police for traffic control from Thursday night until 7:00 p.m. Sunday.

The La Junta police department is part of a larger communications network. The La Junta police, the Colorado State Patrol, the Otero County sheriff's department, the state highway department, the state fish and game department, and all other state agencies in the area are on the same radio frequency. During the day the La Junta police dispatcher handles dispatching, and at night, and on the swing shift, one of the firemen on duty operates as dispatcher. The La Junta police department has two cars with radios on this frequency.

The La Junta fire department has a captain and four firemen who are paid. In addition to these men, there are twenty-one volunteers. The fire department is on the local government frequency that includes the streets and alleys department, the light and power department, the sewer department, the water department, and all other city divisions and mobile units. There are, then two radio frequencies operated by the same dispatcher.

The Colorado State Patrol maintains an office in La Junta under the command of a lieutenant and staffed by two sergeants and a number of patrolmen who cover the three-county area to the Kansas border. There were no paid civil defense personnel in the county. The director of the county health department also serves as director for the Otero County civil defense. This may be a partial explanation for the emphasis on various health measures which were stressed by civil defense during the flood. There are five or six city directors within the county plus a number of volunteers, but the county director points out that all of the personnel were volunteers and this accentuated the need for constant pushing on his part.

Shortly after midnight, Thursday June 17, the state water commissioner for the area notified the La Junta police department that the Arkansas could be expected to flood La Junta as a result of tributary run-off upstream. He urged the police to notify the unincorporated area know as North La Junta directly across the river from La Junta, as it sits appreciably lower than does La Junta proper. The police dispatcher contacted the Otero county sheriff, and by 3:00 a.m. the sheriff had joined two La Junta police cruisers in North La Junta. The three commenced to drive through the streets with their sirens and red lights in operation. Since the local radio station, KBZZ, had been broadcasting flood news for some period of time, there was little necessity for door-to-door warnings. The two agencies believed that the people would understand the warnings, so the three cruisers patrolled the streets, stopping only infrequently to issue personal warning to people. Only a fraction of the 400 residents of North La Junta evacuated as a

result of the initial warning by the police and the sheriff. The sheriff began to take stronger measures, forcibly evacuating at least one resident, and at 6:00 a.m., over KBZZ, he personally issued an evacuation order for the area. At this same time two of the La Junta firemen were sent to North La Junta by the superintendent of public safety while he and the other firemen manned the station in La Junta proper, on the south side of the river.

The police began alerting citizens who lived near the river in La Junta proper, and directed traffic coming across the bridge from North La Junta. Evacuees were housed in several improvised shelters which were opened voluntarily by their owners. No city or county officials arranged for shelters at this time.

Between 8:00 a.m. and 9:00 a.m. Thursday the river started to rise at La Junta, finally cresting at 11:00 a.m. Large portions of North La Junta were covered by the water, and access routes to La Junta were seriously impeded; several more policemen were assigned to traffic work. The majority of the residents of North La Junta were in their homes when the water rose. Although property losses were fairly extensive, there were no fatalities since the water rose at a relatively slow rate, allowing people to keep safely out of its reach.

While the water from this crest was passing through town, word was received (as in La Animas) from the state coordinator of natural resources that the Arkansas would crest a second time, due to water flowing down from the Colorado Springs-Pueblo area. This flood was purported to be of larger proportions than the very damaging flood of 1921. This warning set off a spate of preparation in La Junta. Local stores initiated sandbagging operation, a sergeant from the Strategic Air Command contingent at the local airfield volunteered his men's services to the superintendent of public safety who readily accepted their assistance, and the police captain was recalled from vacation. At 5:15 p.m. the city manager returned from Estes Park, Colorado, where he had been attending a convention, and took active command of flood preparations in the city. He met with the heads of different city departments at 8:00 p.m. and official flood plans were worked out. These included the shutting down of water wells, sandbagging the power plant, and removing vital generators and motors from low-lying areas. Much of the procedure that was followed had been discussed four months prior to the flood when a tentative plan for an emergency like this one had been worked out. By early morning Friday these preparations were completed and the city manager asked certain businesses to sandbag in preparation for excessive run-off. The city offered to dump sand where citizens desired it and made bags available, but no residents were ordered to sandbag. During the morning, the county health director contacted the state public health department and arranged for the U. S. Department of Public Health physicians and typhoid vaccine to be flown into the area. These arrived around noon, and a vaccination program was set up to prevent any possible epidemics due to contaminated water supplies.

By evening most of North La Junta was evacuated. Four hundred families were sent to stay with friends or to shelters which had been previously opened. Large numbers of volunteers from La Junta helped the evacuees move furniture to the National Guard Armory and to a trailer court where it was stored. Evacuated areas were patrolled by the sheriff's posse and the La Junta police and reserve officers assisted the refugees in their exodus. The second crest, predicted for 5:00 a.m.

Friday, actually struck La Junta at 8:00 a.m. It inundated nearly the same area flooded on Thursday. What La Junta actually experienced, then, was two floods about 21 hours apart. The first flood came because of tributary run-off into the Arkansas, and the second flood was a result of the flood waters from Fountain Creek which flowed into the Arkansas River. By noon on Sunday, the bridge between North La Junta and La Junta was open to traffic, and it was filled with people who were moving back into the flooded areas. Some responses of the community are worthy of particular note.

First, while La Junta had twelve to fifteen hours notice concerning the flood, the lack of reliability and accuracy of the information was a problem. La Junta's only reliable source of flood information, the state water commissioner, was difficult to contact and he was contradicted by several other sources, causing considerable confusion at the time. Another communications problem, according to local officials, was the excited and exaggerated mass media reports that were imputed to have contributed to the spectator problem following the passing of the crest through town.

Secondly, many residents of endangered areas failed to respond to warnings until they had been repeated a number of times. Despite some three hours of warning and continuous patrolling of the streets by law-enforcement agencies prior to the first crest, the residents failed to evacuate, moving out only after the river had actually flooded their homes and destroyed much of their property.

Third, sightseers caused a certain amount of difficulty in La Junta, although this was not in the proportion seen in the larger cities. As previously noted, most of this problem arose after the crest had passed through town.

Finally, there was a high degree of interorganizational coordination in La Junta. All of the agencies involved in flood activities seemed well aware of the role which they were expected to play, and communication between organizations was closely maintained.

Las Animas (Bent County)

Las Animas, an agriculturally oriented community of 3,402 (1960 census), sits at the junction of the Arkansas River and the Purgatoire River, a large tributary. To the east of the town is the John A. Martin Reservoir, built on the Arkansas River. In 1911 Las Animas suffered major property damage and lost several lives in the same flood that struck Lamar. High water was also experienced in both 1955 and 1957.

The town government is headed by a mayor. The Las Animas police force has a complement of four men, and maintains liaison with the Bent County sheriff and two Colorado state patrolmen who work in the area. These three groups are in constant communication with one another. Even during normal periods, they handle calls and issue many dispatches through a common office. Las Animas is protected by a volunteer fire department. The Bent County Civil Defense is a completely volunteer organization. There is no active staff other than the volunteer director and a ham-radio operator.

On Wednesday, June 16, Bent County received much storm activity, including heavy rain and isolated tornado sightings. On Thursday the sheriff's office spent most of its efforts in warning ranchers and farmers to the northwest of town to move their stock to high ground in order to protect it from the rapidly rising Adobe Creek which was threatening that area. At this point, information on the condition of the Arkansas was very contradictory and sparse. Both the sheriff's department and the Las Animas police were monitoring the state patrol radio, but neither was able to glean any reliable information as to the probable height or time of arrival of the Arkansas crest although both had been warned to expect one. The sheriff met with the mayor, the civil defense director, and a commissioner, but the group decided that evacuation was not necessary at that time.

By Friday morning both the police and the sheriff's office had decided that there definitely was going to be a crest which would imperil the town. The police initiated action by calling the sheriff's office to check on whether an evacuation was being planned; and when they were informed that no such action was planned, the police began planning on their own along with the volunteer fire department. During the early afternoon the police and fire departments conferred and plotted a course of action. Included in the plan were such things as a list of the aged and infirm who would require assistance, and ways to handle security problems during and after evacuation. The police chief also contacted a local radio repairman and arranged for him to mount a loudspeaker on his car (the repairman's), in order to make possible the broadcasting of evacuation warnings when the time came. The repairman mounted the speaker and later used it according to plan.

After the police had called his office, the sheriff apparently received a call from the state coordinator of natural resources -- warning that the coming flood was to be worse than the flood of 1921, and urging that the town be evacuated. Acting upon this and other subsequent information, the sheriff met again with the mayor, the civil defense director, and one of the county commissioners to plan an evacuation.

The evacuation was planned along lines discussed on previous occasions in regard to air-raid evacuation. The plan included provisions for shelters and food distribution. No sandbagging was arranged at this time because the available information indicated that the flood would arrive shortly after midnight Friday and in such quantities that sandbagging would be futile. Some sandbagging of stores and offices did take place on Friday afternoon on a voluntary basis. While no official suggested or ordered sandbagging, the city did provide sand and bags for those residents who desired to use them.

In order to avoid traffic congestion and the necessity for evacuation in the dead of the night, a hill about 7 miles out of town was chosen as an evacuation sight, and the sheriff began to issue evacuation requests about 4:00 p.m. on Friday. Both the sheriff and the civil defense director spoke over the local radio station. They explained the situation and asked that the citizens evacuate voluntarily. The car with the loudspeaker, for which the police had made arrangements, was commandeered and sent through the streets issuing the same warnings. Residents were also told that, for those who did not evacuate voluntarily, a siren would be sounded one hour before the crest would actually reach the town.

The police were unaware of the action being taken by the sheriff and the civil defense director. The police, along with the fire department, had planned their own evacuation schedules, and there had been no contact between the two groups of planners since the aforementioned morning telephone call. The police did not feel that an evacuation was necessary at that time, but they did cooperate with the plan which was being implemented by the sheriff and the civil defense director. The police patrolled the evacuated community to prevent possible looting while businessmen and homeowners were out of town. Looting was not a problem.

By 8:30 p.m. Friday the voluntary evacuation was completed. About 600 to 800 people moved out, indicating that approximately 25 percent of the population of Las Animas had been evacuated. The sheriff and the civil defense director obtained enough food from a local grocery to fill a tractor-trailer. The truck was sent to the evacuation site, as were two county water-trucks. Then the authorities and populace settled down to await the flood.

By early Saturday morning the sheriff had received reliable information from a state water commissioner, that the Arkansas crest would not arrive until noon, and that it would be of appreciably smaller proportions than had been previously expected. The sheriff and his associates decided that the smaller amount of water could be contained by raising the height of the existing dike, so at 5:00 a.m. Saturday the evacuees were told that they could return to town, and a sandbagging operation was organized to raise the dike. The loudspeaker car cruised the town, and requests for volunteers to sandbag the dike were aired over the radio. About 150 men responded. With supplies which were provided by the city and the county, the work was completed before the crest passed Las Animas shortly after noon.

At the time the crest actually went through the area, early in the afternoon, virtually all of the town's residents were in the city. No evacuation occurred on Saturday. The flood was completely contained within safe limits. None of the houses in the incorporated area were flooded. Two especially salient points should be noted with regard to the warning process in Las Animas. First, both of the main information-collecting agencies that were active in flood work -- the police and the sheriff's department -- reported extreme difficulty in obtaining accurate information on the flood crest. Neither was able to determine satisfactorily just how much water the river was carrying or when it would strike Las Animas. Conflicting reports, from both official agencies and commercial radio stations, indicate the difficulty these organizations encountered in data gathering. As is true in disasters of all kinds, rumors were rampant. The reports from a water commission worker proved reliable, but he was not always in communication with officials.

Secondly, the evacuation seemed to progress rather efficiently. Not only were the people moved, but in some cases their personal belongings as well. A particular evacuation point was established and stocked, and evacuees were informed of this fact. Even though the community did not finally experience flooding, and people had to spend the night away from home, officials are convinced that, on the basis of available information, it was better "to be safe than sorry."

Another point that may be noted in passing was the duplication of effort on evacuation plans by two sets of organizations that were involved in the warning and response.

Lamar (Prowers County)

Three communities in Prowers County suffered flood damage: Lamar, population 7,369 (1960 census); Granada, population 593 (1960 census); and Holly, population 1,108 (1960 census). All three communities are situated on the Arkansas River and they are all oriented toward agriculture. Lamar, the town on which this description concentrates, serves as the county seat. Lamar is 36 highway miles downstream on the Arkansas River from Las Animas; Granada is 17 highway miles downstream from Lamar; and Holly is 11 highway miles downstream from Granada, only 4 miles from the Kansas border. Between Las Animas and Lamar, the Arkansas River is held in check by the John A. Martin Dam. The waters of the Arkansas which passed by Las Animas were checked by the dam. The flooding that occurred first in Holly and Granada, and then in Lamar, was caused by flash-floods from streams that feed into the Arkansas River and by the water of the river itself as it swelled from tributary run-off east of the John A. Martin Dam.

Lamar has a mayor and council form of government. The Lamar police department has a complement of nine men: a chief, two sergeants, and six patrolmen. There are two radio-equipped cars, and the police also have walkie-talkies. There is one radio frequency for the Lamar police, the state highway department, the state patrol, the sheriff's office and the city police of Granada and Holly. There are dispatchers manning the board around the clock; two of these men are paid by Lamar and one by the county. The Prowers County sheriff's office consists of the sheriff and two office deputies. There are also forty-five posse members who are not full-time paid employees. Two radio-equipped cars are maintained.

The Prowers County Office of Civil Defense has a full-time paid director. The assistant director, communications officer, assistant communications officer, radio officer, health officer, and others are all volunteers. The director noted that everyone of them came in during the emergency and stayed for the entire period. The Lamar City CD was not active.

Early Thursday morning the sheriff's office received a call that Granada and Holly were experiencing high waters and that it might become necessary to evacuate, and so he set out to check on both communities. It was evident that Granada had a lot of water, but things were well diked and seemed to be under control; therefore the sheriff proceeded toward Holly. The regular route was impassable, but he managed to reach town by detouring north to Sheridan Lake. As he arrived, people were leaving town, using boats and such to get out, so he called back with instructions for the posse to bring food and blankets. Posse members set out for Holly, but only got as far as Hartman, to the northwest of Holly. Later that evening the sheriff and his men were able to get about fifty people from Holly to Hartman where they were housed in a schoolhouse shelter. Holly was hit first by the water from two creeks and then the river itself. The sheriff and some of his posse members spent the night in Holly.

The Prowers County CD director, who went to Holly at the call of the sheriff, returned to Lamar about 2:30 p.m. on Thursday. He and his communications officer spent the remainder of the day manning the National Warning System telephone, leaving at midnight to go home. Soon after reaching home, the director was notified by the sheriff's department that William Creek was flooding the east side of Lamar. He immediately attempted to have the fire siren sounded to warn people of the danger, but the fire department refused to do so, feeling that the situation did not warrant such action at that time. In the next five minutes Lamar's telephone system was put out of commission by the rising water, seriously impairing interorganizational communications within the city. At 1:15 a.m. Friday the state highway department radio technician who was stationed in Lamar was awakened by a neighbor and was warned to leave his home. He hurriedly evacuated his family just ahead of the flood waters which inundated the area by 1:20 a.m. The police department was advised of the flood danger at 1:30 a.m. when a resident called to advise them of the peril. The police chief went out to investigate, was met by the rapidly rising water, and began to knock on doors and to warn people to leave the area. One of the two police patrol cars was flooded out by the rising water, and all of the local ambulances were out of commission because of the flood, so that when a fire broke out during that time, the three casualties had to be taken to the hospital in a fire truck. Assisted by volunteers, the police chief and his men continued to warn people and to help them to evacuate from the area throughout the night.

At approximately 1:30 a.m. the Colorado state patrol radio base station, situated 10 miles northeast of town, was flooded. Because this tower relays into the Lamar police station, both police and patrol cars were forced to go to a car-to-car basis of communication until the radio technician was able to get to the tower with his truck and pick up the transmitter at 4:30 a.m. The transmitter was brought into town, and, with the use of a fire truck, was set up in the police station. In the meantime a patrol car was stationed to the east so that it could relay messages on to Pueblo.

By 4:30 a.m. Friday the waters of William Creek, which had been the source of flooding to this point, began to recede slightly; some of the residents who had fled the eastern sector of Lamar were able to return to their homes and survey the damage. While these people were returning, others were leaving their homes for the first time, just having learned of the flood threat. At this time there had been no organization of evacuation centers; one group of evacuees broke down the doors of the local armory, another group found shelter in a similar manner at the Parkview School.

KLMR, the Lamar radio station, stayed on the air all night. It began broadcasting warnings of the William Creek flood around Thursday midnight, but the number of people who learned of the flood via this medium was limited because of the late hour. As daylight came to Lamar on Friday, the emergency caused by William Creek was complicated by the rise in the Arkansas River due to its tributaries flooding upstream. At 7:00 a.m. KLMR received word that the river was cresting; and at 7:30 a.m. the police were not only notified of the crest via the state patrol radio, but told that it was to be a larger crest than the flood of 1921. By 8:00 a.m. the police chief, several volunteers -- apparently partially recruited by pleas for help on KLMR, and a few sheriff's posse members were knocking on doors and using loudspeakers in the northwestern section of town, trying to evacuate the people.

KLMR had begun to broadcast notices for the area at 7:45 a.m., but when water began to flow over the dike at 8:30 a.m. many residents remained unevacuated. The police and fire departments' personnel were forced to wade through floodwater and to use boats to get people out. At 9:18 a.m. the city power supply was inundated by the river, and this forced both KLMR and the police-state patrol radio stations, both of which depended on city power and had no auxiliary power available, to cease broadcasting. From this time until 2:30 p.m. a state patrol car was stationed in Lamar and served as a dispatching center for law enforcement agencies.

During the remainder of the morning evacuation continued, shelters were set up, and supplies were brought in. Bedding from Utah, Fort Carson and the Lamar CD emergency hospital was used in the shelters, and feeding operations were gradually set up. Fifteen hundred people were evacuated in Lamar. By Friday evening the National Guard had moved a detachment of twenty-five men into town to assist the police with security duty.

The problems faced in Lamar were similar to those faced in many communities. First, alert was made difficult by the swiftness of the flood. There was no time for planning or leisurely evacuation. Second, there seemed to be a reluctance among the populace to leave their homes. Third, due to the flood, communications were complicated by two equipment failures. Very little looting occurred in Lamar.

FOOTNOTES, CHAPTER III

1. U.S. Army Corps of Engineers, Volume I; Summary Report, South Platte River, Flood Plain Information, Metropolitan Region, Denver, Colorado (Omaha, Nebraska: Corps of Engineers, October, 1963), p. 6.
2. Larry J. Borger, "Municipal Government Responsibilities in Disaster Situations with Special Reference to the Littleton, Colorado Flood of June 16, 1965" (Master's thesis, University of Kansas, 1967), p. 38. Much of the material in this section describing the structure of the Littleton city government is a paraphrase from Mr. Borger's thesis.
3. Ibid.
4. Ibid., p. 39.
5. The Denver Post, Vol. 73, No. 319, June 16, 1965, p. 1.
6. The Denver Post, Vol. 73, No. 320, June 17, 1965, p. 58, quoting A. W. Cook, meteorologist, U.S. Weather Bureau, Denver.

CHAPTER IV

DISCUSSION

As mentioned in the first chapter of this report, there are a number of dimensions along which disaster response, and more specifically warning response, may be measured. This discussion categorizes communities on the dimension of time. How much time elapsed between the initial warning and the onslaught of the disaster agent? -- in this case, the flood. The communities are divided into the following groups: "no warning," "moderate warning," or "extended warning." The middle group is further divided on the basis of community size. This does not imply that time is the most important or essential dimension, but rather, that it is a simple tool for classification. Figures 3 and 4 present a partial synopsis of warning problems in the areas under discussion.

No Warning: Castle Rock and Lamar

Although they are located in different parts of the state and are situated along two different rivers, the two communities are comparable in a number of ways. Both communities were the victims of true flash floods which were totally unforeseen, and therefore, neither had any warning. In both instances the floods resulted from torrential rains which filled normally small streams in excess of their usual levels within a matter of two or three hours. Both communities are located in rural areas and are well removed from major metropolitan centers. Neither community had elaborate monitoring or warning equipment or organization. Both Douglas County (Castle Rock) and Prowers County (Lamar) retained paid civil defense directors; in Douglas County the director was officially employed on a three-quarter-time basis. Mayors headed the town governments of both Castle Rock and Lamar. Data indicate that neither Castle Rock nor Lamar had an active civil defense unit at the time.

In both communities there were many similarities in the pattern in which the warning process took place. Response was impromptu and on an ad hoc basis. Lack of warning, while complete, was only one factor. Protective agencies in both communities were small, limited, and marginally equipped. As a result of the speed with which the disaster struck and because of the lack of immediately available trained personnel, the response differed little from that of any other group of citizens.

Due to the suddenness of the disaster, sheriff's auxiliaries -- the only obvious source of trained personnel in either community, were not mobilized until after the floods had occurred. Even where there had been time for prior warning, as in a particular section of Castle Rock and in relation to a second flood from another source in Lamar, people were reluctant to evacuate their homes. With the exception of the fire siren in Lamar (which was not used because fire department personnel did not believe that a major disaster was at hand) neither community was equipped with a mechanical emergency warning device. In Lamar complications were furthered by flood damage to communication (telephone and radio) equipment.

Figure 4: Partial Synopsis of Warning Problems
Area I, Group I (Northeast Quadrant)

	Confir- mation	Communi- cation	Adminis- trative Delay	Inter Organi- zational Coordi- nation	Reluc- tance of Public to Evac- uate	Spec- tators	Peri- meter Traffic Control	Rehearsed Disaster Plan	False Warnings of Addi- tional Floods
Castle Rock	+	-	-	-	+	+	0	+	-
Littleton	+	-	-	-	+	+	+	-	+
Englewood	+	-	-	-	+	+	+	+	+
Denver	+	+	-	+	+	+	0	+	+
Brighton	+	+	-	-	+	+	+	+	-
Greeley	+	+	+	-	+	+	+	+	-

Legend: + = problem
- = no problem
0 = no judgment made

Figure 5: Partial Synopsis of Warning Problems
Area II, Group II (Southeast Quadrant)

	Confir- mation	Communi- cation	Adminis- trative Delay	Inter Organi- zational Coordin- ation	Reluc- tance of Public to Evac- uate	Spec- tators	Peri- meter Traffic Control	Rehearsed Disaster Plan	False Warnings of Addi- tional Floods
Pueblo	+	+	+	+	0	+	0	+	+
Lajunta	+	-	-	-	+	+	+	+	-
LasAnimas	+	+	-	+	-	-	-	+	-
Lamar	+	+	-	-	-	-	-	+	-

Legend: + = problem
- = no problem
0 = no judgment made

County protective agencies, the sheriff's departments, and the county civil defense played major roles in both communities. No real distinction seems to have been made by them between town and county domains; the sheriff's personnel worked in both without regard to boundaries. This was particularly true in Castle Rock, perhaps because the town had only a sixth or a seventh of the population of Lamar. The bulk of warning and organizational response was carried by county officials, the sheriff, and the civil defense director.

The speed and magnitude of the disaster agents made demands upon the existing organizations in the communities that far exceeded their resources for response. As a consequence, we may say that both communities suffered disaster, and that they needed outside aid during the emergency period and the period of recovery. In Castle Rock, helicopters were brought in to help with evacuation of stranded persons. A detachment of twenty-five National Guardsmen were moved in to help the police with security duty in Lamar. Immediately after the disasters, the Red Cross and the National Guard expended a tremendous amount of time and money in helping the communities to get back on their feet, but compensation will never be made for much of the damage. For example, in Lamar, damage to the town was complicated by major losses in surrounding farmland. Thousands of beef cattle were lost in the flood, and crop damage was severe. In an area that is heavily dependent upon agriculture for its livelihood -- both directly and indirectly -- this means that economic hardship will continue to be felt for a number of years.

Moderate Warning: Small Cities--
Littleton, Englewood, Brighton and La Junta

This group of communities shares two specific attributes. They are, roughly speaking, small to moderately sized communities ranging in population from 7,055 to 33,398 persons. All four of the communities had advance warning of the floods, although in no case did this warning exceed a few hours. The warning period, then, was essentially the same as in the cities of Denver and Pueblo, but the resources and manpower which were available for coping with flood problems were of a substantially different nature.

No forecast period existed for any of the four cities in this group. All received their first flood notice in the form of a firm warning that a flood would occur, and that the community should be alerted to the danger. Since there are some unique aspects about reaction in La Junta, first the other three towns will be discussed as a unit; then La Junta will be discussed separately.

In Littleton, Englewood, and Brighton, the police bore the brunt of the alerting task, although the Arapahoe and the Adams County sheriff's departments and the Littleton fire department were also quite active in warning the general public. These agencies mobilized very rapidly and may safely be described as having proceeded in the most organized and methodical manner of all the organizations studied. The information vacuum noted in other cities was a problem for the agencies in these communities. Also, there were some intracity communications problems. An example of intracity communications problems may be seen in the one-and-one-half hour gap between the time the Littleton police department learned of

the impending flood and the time the Littleton fire department obtained the information. However, in spite of the information vacuum and some intracity communications problems, warning and response were handled rather smoothly. In Littleton, for example, the police and fire departments worked closely together in the evacuation process; and the civil defense director provided information on the progress of the flood itself. The city manager returned to town as soon as possible. Not many hours later, nearly all branches of the city government were assisting in the response.

In Brighton, smallest of the three communities, volunteers played an unusually large and important role. Volunteers aided local police and actually handled much of the evacuation themselves; they helped those who required their assistance and warned others of the impending danger.

The confirmation problem was common to all of the communities. Fire and police departments reported receiving large numbers of calls from residents who sought confirmation of the warnings they had received from other sources. Men in the field were faced with a significant number of persons who were extremely difficult to convince of the danger that approached them. The problem may have been complicated by the varying patterns of the commercial radio stations. Depending on the station to which a listener was tuned, he would have heard one of three patterns of broadcasting. A number of stations broadcast flood damage and evacuation pleas on a full-time basis. Others issued only intermittent warnings, and a third group did not participate in flood coverage at all.

Interagency coordination reached a high level of efficiency in Littleton, Englewood, and Brighton. There may have been a number of reasons for this -- among them we will see at least one that stands out as a partial explanation in each community. Littleton had been through a mock-flood simulation one year before it became a reality. The overall strategy of response which was executed there during the flood was taken from the simulation experience. Englewood had the advantage of having both the police and the fire departments located in the same building. In Brighton, two organizations (police and fire) handled the bulk of the work within the city, and one organization (the sheriff's department) handled the bulk of the work in the unincorporated areas. This simply meant that there were fewer agencies to be coordinated in Brighton.

Each community had some experiences which were common to all and also some which were unique. The unique case of La Junta will be described. La Junta had a population (8,026) roughly equivalent to that of Brighton (7,055). All of the communities had received advanced warnings of the flood. In La Junta there was a period of 8 hours from the time the first alert had been received until the water began to rise, and a period of 10 hours from the first alert until the crest actually appeared. None of the communities had received a forecast in which officials were told to be aware of possible danger. In each case, the first official warning carried the message that floods should definitely be expected. In La Junta, the response of official organizations to the warning was an immediate alert to the community.

Interagency coordination in La Junta was efficient, as it was in the other communities. This may be partially due to the administrative structure of the police and fire departments of La Junta and to the official communications network

in southeastern Colorado. The police and the fire departments in La Junta are under one administrative head, the superintendent of public safety. The communication system is organized in a fashion which allows a high level of interorganizational communication. There are two radio frequencies which are shared by the various city, county, and state agencies in the area, and dispatchers are shared in common.

Two parts of the warning-response to the first flood in La Junta were significantly different from the other communities. First, in spite of the early official warning and the immediate response of the relevant organizations in La Junta, the populace did not take protective action. Second, confirmation was more of a problem in La Junta than in the other communities. What were the differences in the warning system and process between La Junta and the other communities? Will they help to explain the lack of response from the populace and the difficulty of confirmation?

First, most of the alert in La Junta took place during the early morning hours before daybreak. Most people were at home, asleep, and not especially sensitized to the possibility of a disaster. The assumption by the police and the sheriff that people were alert to the probability of a flood does not appear to have been well-founded; even though the local radio station had previously broadcast news of the flood, it had been concentrated on other communities, and there was no hint that one might eventuate in La Junta on that particular day. Also, there was a lack of visual confirmation. A resident of North La Junta would have had difficulty in discerning action which would serve to confirm an alert message -- city government made no preparations, the river did not appear to be threatening, and none of the public officials except the police and the sheriff participated in warning.

In comparison to the other three communities, another unique experience for La Junta was the occurrence of a second flood. The second warning in La Junta began on the afternoon of the same day, Thursday, and ran through the next morning. This flood, like the first one, had no forecast period. A state official issued the initial warning predicting a very severe flood, and urging an immediate evacuation of the town. Response to this warning was more thorough than it had been to the warning of the earlier flood. City officials as a whole responded, sandbagging was officially requested, and extra-community help in the form of military personnel was used. The action of the general population paralleled that of the officials in that it was more serious and complete than during the previous flood's warning period. Within a few hours, nearly all of the residents in North La Junta were evacuated -- in vivid contrast to the first flood, and community-wide cooperation enabled the evacuees to remove many of their belongings.

Why the vast difference between the two warning periods? Two reasons seem especially significant: Confirmation was more readily available for the later one, and the community had just experienced an event of disastrous proportions. Experience may be a great teacher. In no case does this seem more evident than when viewing the events which took place in La Junta. Having just ignored the warning of officials, and having suffered because of this, the public was better prepared to accept the new warning as having a basis in fact. Also, it was easier for the average resident to obtain confirmation of the threat of a second flood. The local newspaper carried flood warnings, the radio station urged evacuation,

and emergency preparations were evident throughout the town. In addition, the river, though reduced from its previous height, remained at a threatening level.

Moderate Warning: Medium and Large Cities--Denver and Pueblo

Denver and Pueblo, the two largest cities in Colorado, underwent similar experiences during the floods. Both cities had relatively large and professional organizations working within the community e.g., Denver and Pueblo had police departments with 801 and 138 people respectively. Both cities are county seats with a number of state offices located within their confines, and state capital offices are also situated in Denver. As for the smaller cities which were considered earlier, no forecast period existed for them. The first warning was decidedly an alert message.

The reaction which followed the alert message was approximately the same for them as for other communities in the state. Police and fire departments handled the majority of the responsibility for disseminating the warning to the general public. In Denver and in Pueblo, radio stations played a somewhat more important role in the warning process than elsewhere. This was due chiefly to the greater concentration of stations, with more elaborate staffs and facilities in the larger cities.

A number of problems were noted in the description of the warning process in the two cities. Some of these problems were also present in the smaller communities, but certain of them were unique to Denver and Pueblo and more serious in these two communities. Interorganizational coordination was not at a high level during the alert stage. In each city, the several agencies which were involved in warning the populace and preparing the city for the flood tended to work autonomously or in small groups. For example, the police and fire departments worked together in Denver, as did the civil defense and the Red Cross, but communication and coordination between the two pairs of organizations was at a minimum.

Closely related to, and affecting the coordination problem, was the administrative vacuum which existed in Denver and Pueblo. In both cities several of the most strategically placed administrators in the community evidenced extreme reluctance to take decisive action. In a number of instances key administrators were in the field surveying flood preparations, or they were engaged in related activities which effectively isolated them from others. This made communication between officials and strategic organizations more difficult.

Mass media in the metropolitan areas had both positive and negative effects with regard to alerting the public. Very few organizations initiated contact with radio or television stations. However, stations picked up flood information rapidly, and several of them switched to full-time flood coverage during the warning period. Use of mobile units, "roving reporters," and a variety of other methods provided stations with a plethora of detail on the expected flood. A great deal of this information was broadcast immediately after its reception. While much of it was valid, a substantial segment of the information was not authentic. The time pressure, the enormity of the disaster agent, the uncommon occurrence of this

type of situation, and a number of other pressures -- combined with the difficulty of validating any information during the warning period, caused nearly all stations to broadcast at least some misinformation.

As it developed in Denver and Pueblo, confirmation was the most crucial problem in the warning process. Residents received a confused picture of the situation. This was due, in part, to the lack of accurate information which was received by the warning agencies and the mass media; and, in part, due to the great variety of sources which were releasing information. A resident in the threatened area could have been warned by a number of governmental organizations and three or four different radio stations, all of which could have presented him with different pictures of the flood danger and with different instructions concerning what action should be taken. In addition to erratic and contradictory information releases, confirmation was confused by the fact that the environmental factors were not particularly threatening in either city. In Denver the sky was relatively clear and the sun was shining, and in neither city did the river appear dangerous. The floods rose with exceptional speed. As little as an hour before the arrival of the crest, there was no way of telling that a flood was imminent by looking at the river in question. The difficulty of confirmation may also have contributed to the lack of response by the public and to the fact that spectators milled around in a number of dangerous areas.

Extended Warning: Greeley and Las Animas

There are some similarities between Greeley and Las Animas. Both communities are somewhat isolated from metropolitan areas, and both are agriculturally oriented. In terms of their experience with the floods of June 1965, they both received extended warnings, and neither community suffered any real damage as a result of the floods. In Greeley, responsible officials were warned 16 hours before the South Platte River crested, and 24 hours before the Cache La Poudre River crested. Las Animas had almost 48 hours advance notice before the arrival of the Arkansas River crest.

While the communities had sufficient warning for adequate preparation for the expected floods, officials in both towns experienced great difficulty in obtaining accurate information. In Greeley, information from an official state source was found to be grossly erroneous in its estimate of the arrival of the expected Platte flood. In Las Animas, inaccurate information from a state official precipitated a premature evacuation and delayed the decision to sandbag the dikes.

It might well be said that no forecast period existed for either Greeley or Las Animas. Despite the length of time between the first notice of a flood and the actual time when the crest moved through the towns, neither had received a forecast in the usual sense of the term. Greeley's first notice was in the form of an evacuation warning which purportedly gave local authorities three hours in which to act. Advice received in Las Animas, from a state official, was to "evacuate now." The information which had been received in Las Animas prior to the communication from the state official was so ambiguous and unreliable that his message was the first definite and (supposedly) reliable data on which officials had to act.

In addition to the number of similarities between the two communities and the experiences that they shared, there are also a number of differences. Greeley had seven times the population as Las Animas. Its paid police force was twelve times that of Las Animas. Greeley, then, had greater resources with which to meet the threat.

Greeley and Las Animas may also be contrasted with regard to their previous experience with floods. Greeley had no prior floods of any consequence. Both officials and the general public may easily have lived next to the South Platte River in Greeley all of their lives without witnessing a flood of major proportions. This was not the case in Las Animas. This town, located at the junction of two rivers with histories of periodic flooding, has had experience in dealing with this type of disaster threat. Long-time residents still talk about the "Flood of 1921." The town had undergone two recent sieges of high water in 1955 and 1957. Las Animas seems to have developed an awareness among its officials and populace of the potential danger of a flood, of the problems that may accompany rising water, and of the kind of protective action needed in such a situation.

Warning of the general public followed different patterns in the two communities. In Greeley, the organizational response was of a "wait and see" nature. Officials never did issue a public alert because the Cache La Poudre crested before they were able to make widespread notification of the situation. Only a few persons were evacuated, and they were alerted on an individual basis. In Las Animas, all available means of communication were rapidly employed to disseminate warnings. Evacuation, which later proved unnecessary, was carried out hours before the expected crest, so as to avoid problems of darkness.

A difference may also be seen in the confirmation process in the two communities. Both communities had difficulties in obtaining confirmation of information on the organizational level. In Greeley, some officials watched for confirmation via mass media and then delayed further action to see how events would develop. Data indicate that no special community-wide warning or emergency effort served to confirm the evacuation warnings, nor were there any special news bulletins issued. In addition to the facts just listed, was the lack of experience with floods in Greeley. Together, these matters may have contributed a great deal to the seeming lack of response in Greeley. Officials in Las Animas reacted rapidly and directly to the first official and unequivocal alert which they received. The general public in Las Animas had little difficulty in confirming alert messages. The sheriff and the civil defense director were broadcasting radio warnings which helped to validate information from the loudspeaker-car which was cruising the streets. Limited sandbagging operations in the downtown area also helped to confirm the threat.

The contrast of the two communities in attitudes and response of public officials and the general public may be due, to a large extent, to the contrast of their prior flood experiences. Evidence from other studies made by the Disaster Research Center and elsewhere indicates that, while experience is not a guarantee of more rapid or complete response from a community to a warning process, it does contribute to general sensitivity to disaster cues, and consequently, to less reluctance to issue public warning.

There was also a contrast in interorganizational coordination between these two communities. Cooperation was at a high level in Greeley -- both between the organizations within the city and on a city-county basis. In Las Animas there was cooperation between the city police and the fire departments; and between the sheriff, the civil defense director, the mayor, and the county commissioner. However, there was no coordination between these two groups. Two separate sets of plans were developed, and the mayor and the sheriff carried out an evacuation about which the police and fire departments were unaware until it was well underway. When the police did become aware of the evacuation, they cooperated by patrolling the evacuated area as protection against possible looting.

Three factors can be isolated as contributing to the differences in inter-organizational coordination between Greeley and Las Animas. First, the various city and county agencies in Greeley are in close physical proximity to one another, whereas in Las Animas, they are separated by several blocks. Second, is the way in which personnel of the various agencies in the communities perceived their roles. In Greeley, the view seems to have been that the work of city agencies should be confined within its boundaries; and that of county officials be limited to areas outside the city limits. This did not negate the idea of extending aid to one another should it be requested. County agencies in Bent County seemed to view the town as falling within their province; and they felt responsible for any emergency measures taken, even within the incorporated areas of Las Animas. Third, interpersonal factors played a role in the lack of interorganizational coordination in Las Animas. Neither of the communities experienced appreciable flood damage.

Summary

In conclusion, a few additional comments on the overall picture are necessary. First the communications gap between state and local levels must be noted. That this gap was the source of considerable difficulty for local officials throughout the state is made evident by the data. What may not be so evident is why this occurred. Two factors seem to be especially relevant in this regard. Either state agencies did not perceive warning as their task, or if they did, the general communications breakdown caused by the floods and their own lack of resources combined to foil their efforts. The Colorado state patrol was the only agency sufficiently equipped to transmit warnings to local officials across the state, but it lacked the professional knowledge necessary for estimating and predicting flood conditions on its own. Also, the state patrol apparently did not perceive itself to be responsible for warning all of the communities of the flood danger, feeling that this was the responsibility of other organizations better qualified for the job, such as the Colorado Department of Natural Resources, the Weather Bureau, or commercial radio. The Weather Bureau was effectively prevented from playing a significant role in the warning process by the rapidity with which the floods struck. It simply had no time to gather the necessary information for issuing warnings.

The two state agencies which did appear to feel basic responsibility for warning, the Colorado Office of Civil Defense and the Colorado Department of Natural Resources, were operating under dual handicaps; neither had adequate

facilities of its own for communicating rapidly and positively with local officials. The Colorado Department of Natural Resources was forced to utilize state patrol headquarters and, in the words of one official, ". . . every possible method that we could think of . . . we were many times unable to predict . . . what method of communication was getting through to the local authorities so we used everything." At various times the department used Associated Press and United Press International wire services, commercial radio, telephone, Colorado State Patrol microwave, etc., in its efforts to warn local authorities, but still the local officials complained of receiving inaccurate information or information that did not arrive in time from this office. Thus, although the department was able to press extraordinary forms of communication into service, it was still frustrated by the general communications breakdown. Many of the flood-stricken communities were without telephone service for hours or days at a time during this period. Radio was often the only medium through which contact could be made with affected towns, and this considerably less than foolproof. Interviewees throughout the state commented on the extremely heavy radio traffic, both on state patrol frequency and on citizen's band and ham radio frequencies, such traffic often being so heavy that messages could be transmitted only with great difficulty, if at all.

The Colorado Office of Civil Defense was faced with a similar situation in that Colorado Office of Civil Defense headquarters had only marginally effective communications equipment, relying heavily on telephones. Their problem was compounded, however, for they not only had to transmit information to local officials, but were also faced with the matter of obtaining the information, having no readily available source, as did the Colorado Department of Natural Resources. The sorting and validating of information was a complex and time-consuming job, both for the Colorado Office of Civil Defense and for commercial radio stations. Information sources abounded during the disaster, but the validity of this information was often questionable.

Commercial radio might well have played a more strategic role in another part of the county. Radio stations in Pueblo and Denver were very active in disseminating warnings as was mentioned earlier, but in the rural districts radio was not as integral a part of the warning system. Many of the rural towns have no station of their own, or at most a relatively small one. Though the integration of these stations with local warning agencies may be greater than that found in a large metropolis, they were often washed out, or were only on the air during the daytime, therefore being limited in the aid they were able to give.

Finally, the spectator problem found in Littleton, Englewood, Denver, Pueblo and to a lesser extent in certain other communities, deserves emphasis. Police and other officials were nearly unanimous in condemning "irresponsible radio coverage" as being responsible for this, while radio stations emphasized the caution and restraint of their broadcasting when interviewed. The truth undoubtedly lies somewhere between the two extremes. It also seems likely, that, given the most conservative and restrained broadcasting possible, a spectator problem would have existed in these cases. The weather was favorable and the event unusual. It would be unreasonably not to expect a certain amount of spectators under these conditions, since there had been no particular planning or public education programs for such an eventuality in any city. The data tend to show more serious problems in the larger towns and cities and in communities without any flood experience.

CHAPTER V

CONCLUSION

Hindsight is generally easier than foresight, but it can be useful, in that, what is hindsight in relation to yesterday's disasters may serve as foresight in relation to tomorrow's disasters. A number of conclusions and implications may be drawn from an analysis of the events which took place in June 1965 in the ten Colorado communities studied in this monograph.

Warning has been defined as the transmission of messages to individuals, groups or populations which provide them with information about (1) the existence of danger and (2) what can be done to prevent, avoid, or minimize the danger.¹ If we view warning as a process, it is possible to examine the happenings in the Colorado flood in terms of the various stages of the process. Williams suggests seven steps in the warning process and Adams² divides warning into three stages (forecast, alert, and confirmation).

Forecast

The forecast stage, as described by Adams, includes the following four steps according to Williams' scheme:

1. Detection and measurement or estimation of changes in environment which could result in a danger of one sort or another.
2. Collation and evaluation of the incoming information about environmental changes.
3. Decisions on who should be warned, about what danger, and in what way.
4. Transmission of a warning message or messages, to those whom it has been decided to warn.³

The same four steps are a part of the alert stage as described by Adams. The difference is that the forecast message is that "it may happen" and the message of the alert stage is that "it has happened." In a flood situation, early detection of danger signs may be given. The message suggests that there are danger signs that may lead to a flood. The alert follows the same four steps and it informs people that flooding has occurred and the flood is definitely on the way. In the Colorado floods, detection came so late that the message skipped the forecast stage and the process began at the alert stage.

In certain types of disasters official organizations are extremely well equipped and staffed to plot the time and place a disaster agent may strike well in advance (e.g., hurricanes). It has been suggested that in certain kinds of

disasters forecast is the strongest stage in the warning process. This is not the case in all natural disasters. Hurricane forecasts may represent one extreme of strong and extensive forecast and earthquakes the other extreme with absolutely no forecast. Between these two extremes may be found the flood disaster. In some communities with periodic flood threats, the forecast stage has been highly refined, e.g., Cincinnati, Ohio. The Colorado floods had no forecast stage.

There are a number of factors that may have contributed to this lack of forecast. The detection, measurement, collation, evaluation, decision to warn, and transmission of flood data depends on both official and unofficial resources. Official organizations that are in the business of forecast often need a high quality of technical equipment, a nucleus of trained human observers, and equipment to communicate their findings. These resources are often more readily available in large population centers, or on a state or regional level. Smaller communities may not be able to afford them. In the Colorado floods the state had equipment and personnel; but these resources did not seem to function until the alert stage. Where they did function efficiently in detection and measurement there was a breakdown in communicating this information to a central headquarters for collation and evaluation. Where the central headquarters was by-passed, and information was passed on to the various affected communities and organizations, communication was just as great a problem. The difficulties here seemed to center around faulty technical transmission equipment and the isolation of personnel in the field from means of communication.

In addition to official sources in the forecast, there are unofficial sources. Members of one's family or peer group may pass the word of danger. "Old timers" may be aware of signs that indicate possible danger. Particularly in areas that experience periodic disasters, the populace may develop a sensitivity to environmental clues and to information coming from all sources, official and unofficial. In Colorado the environmental factors did not seem to indicate any kind of potential danger, e.g., the weather was clear in many communities and the rivers, which later flooded, did not appear dangerous. In the southeastern quadrant of the state there had been some flood experience that may have acted to make the officials and populace more sensitive to signs of danger, but in the northeast quadrant there had been virtually no prior experience until flooding.

If it is true that warning is the beginning of the human adaptation to disaster, and that forecast is the first stage of the warning process upon which the subsequent stages are built, and that there was no forecast stage in the Colorado floods of 1965, then it is in order to conclude that the response of the various communities and organizations affected was off to a weak start.

Alert

The second stage in the warning process, alert, includes the same four steps as forecast.

1. Detection and measurement or estimation of changes in environment which could result in a danger of one sort or another.

2. Collation and evaluation of the incoming information about environmental changes.
3. Decisions on who should be warned, about what danger, and in what way.
4. Transmission of a warning message or messages, to those whom it has been decided to warn.

The difference is in the content of the message. The forecast suggests possible danger; the alert informs people that "it is here." It is at this stage that the warning process in the Colorado floods really began. The first official message received by the various organizations and communities affected was that danger was on the way.

There are a number of problems that may be seen at this stage of the warning process. In this stage, as in the earlier stage, all four steps of the process showed some weaknesses. There was an advance alert in all the communities except two. The alert, however, was of an incomplete and ambiguous nature.

In most cases step number one, the detection and measurement or estimation of changes in the environment, was on an ad hoc and impromptu basis by people untrained in the field. Sheriff's deputies, police officers, civil defense personnel, newsmen, and community leaders made up the majority of personnel doing detection and measurement. In the one instance where a trained water resources person was sending back information, his efforts were hampered by a breakdown in the fourth step, transmission. He was isolated and his equipment was not adequate so that others could readily reach him.

As time progressed a few civil defense directors, including the state director, began to set up centers for collation and evaluation of incoming information about environmental changes, step number two. This task was made difficult in that the information being collated and evaluated was from a number of sources and some of it was ambiguous and contradictory. If there had been one or two trained and equipped official sources, the centers receiving the information would have been in a position to give varying weight to reports from different sources, but, as just suggested, this was not the case.

The third step in the alert stage, the decision of who should be warned, about what danger, and in what way, also had an ad hoc character in its early stages. Law enforcement agencies were most often the first organizations to hear about the impending danger. Calls from the field, via radio and telephone, were placed to communities downstream along the flood routes. The Colorado State Patrol radio was carrying information on a state-wide scope, and the Colorado office of civil defense was relaying messages to its counterparts in the several counties and towns involved.

In the third step there was no problem about the decision to alert and about what the danger was; the danger was a flood and it was already in process. The decision about who to alert did not seem to follow a prearranged plan. In most cases, established organizations were the first to be notified. This was not by prior plan, but because of liaison between various organizations that existed before the disaster and because these people were the most likely to be the ones on the field detecting. Established organizations are also the ones that are usually notified in any kind of emergency.

Once the alert was received by these organizations it was disseminated in differing patterns. In some cases the message was forwarded to the public by all available means, including mass media, sirens, public address systems mounted on cars and trucks, and door-to-door warning. In a few communities there was a hesitancy about the alert. In two communities, there was a delay in passing on information to organizations that should have been alerted, e.g., police and fire departments, and in another community the fire department refused to sound the siren to alert the public, feeling that the danger was not imminent enough.

Decisions regarding warning are the responsibility of key organization officials, and particularly key community leaders. What then are some of the considerations that affect whether officials will decide to alert the general public and call for the evacuation of the danger areas? Anderson⁴ suggests the following four: (1) the nature of the information received from sources outside the community, (2) changes in the community's environment that can be observed locally and can indicate impending disaster, e.g., increasingly rising river levels, (3) the past experience of officials, and (4) the anticipated reaction of the public, particularly in the event of a false alarm.

The nature of the information received from outside sources, while often incomplete and ambiguous, was clearly an alert, and usually carried the strong suggestion of evacuation. The second and third reasons were the weakest points in a number of communities. The environment did not seem threatening in a number of these communities, e.g., in Denver the sun was shining, and along the Arkansas River the water was not at a threatening level; and officials in the northeast quadrant of the state had little or no past experience with floods.

The fourth step in the alert stage is the transmission of the warning message to those whom it has been decided to warn. There were a number of factors about this stage that are worthy of mention. In a number of instances, particularly in the smaller communities, there was mechanical failure of equipment. In one community the telephone lines, in any heavy storm, were not operable. In other areas radio transmission stations were knocked off the air by flooding, and car radios with limited range had to be used. It is often assumed that commercial radio stations operate around the clock, but this is not the case in a number of smaller communities. It was also true, in at least one community, that the time of the alert broadcast played an important part. The alert came very late at night and people were not listening to the radio at that hour. The approach taken to the alert differed according to the station handling the news. Some stations went on full-time coverage, other stations made extra spot announcements and gave part-time coverage, and still others did not switch from their regular programming during the alert stage.

The content of the alert message and the people delivering it play important parts in the success of the alert. Does it have a sense of emergency? Is it specific in its instructions about what people are to do and when they are to do it? The alerting process varied considerably on all of these questions. In most cases the alert suggested that people evacuate voluntarily. In some cases, when people did not respond to voluntary evacuation, a more urgent alert was issued. Some communities were very specific about instructions given to the populace, e.g., one community picked the particular spot some miles out of town to which people

were to evacuate. Other communities were less specific, but gave some clear idea of what areas were in danger and suggested people in those areas evacuate to safer ground. Still other communities gave no idea as to where people should evacuate. The person delivering the message may also be of importance, e.g., in one community the sheriff and civil defense director made the radio announcements themselves.

Another factor in transmission is interorganizational coordination. The size of the community no doubt plays some role here. A large community has many more organizations to coordinate and interorganizational communication may become a problem. A very small community may have only a few small organizations and coordination may be on a very interpersonal basis. This kind of small and informal situation may be more easily influenced by interpersonal factors, sometimes of a negative kind, e.g., the case of one community where there was an overlapping of efforts because of prior friction between administrative heads of organizations. Communities facing a disaster threat need all the manpower available, and lack of coordination and overlapping of duties is an inefficient use of that manpower.

Confirmation

The third stage in the warning process, confirmation, includes the following steps according to Williams⁵ scheme:

1. Interpretation of the warning message by the recipients and action by the recipients.
2. Feedback of information about the interpretation and action of recipients to the issuers of warning messages.
3. New warnings, if possible and desirable, corrected in terms of responses to the first warning messages.

When people have been alerted, that is not the end of the warning process. There is a need to confirm the alert. If an alert is to lead to protective and/or preventive action, organizations and individuals need to have the alert confirmed. In some ways this may be the most important stage of the process. Confirmation is particularly important where there is little experience with the danger being faced. In London during the Second World War, an air-raid siren needed no confirmation in order for people to take protective action, but in a community where people have never experienced a flood of major importance in their lives it is an absolute necessity. Williams makes this point well, "When people get a message saying 'this is it!' they seem to need a second message which says, 'yes, this really is it!'"⁶

Adams underscores the importance of confirmation when he writes:

Most persons would prefer to believe that they are safe rather than in danger and also that despite the sounding of an alert signal nothing bad will happen. With the exception of those persons that are psychologically set to believe the worst in any situation and those

who have recently suffered a "near miss" disaster, this generalization is probably valid for most persons in warning situations. Thus initial interpretation of an alert signal is likely to be the most unalarming of those alternative interpretations available. An air-raid siren indicates first another test, a drill, or a mistake -- only when these definitions are proven to be untenable are other less acceptable interpretations considered. Any ambiguity or apparent contradictions in the warning messages and environment will typically be cited as evidence not for the worst but for the best. From this perspective a successful warning becomes, as Withey suggests, "a function of the amount of information to be contradicted . . . a confirmation of one alternative among several possible ones."⁷

In a follow-up study of the response of families in Denver the Colorado flood, the four following patterns of confirmation emerged:⁸ (1) Appeal to Authority. A small percentage of families attempted to directly contact some type of local authority. More than half turned to their radio or television. (2) Appeal to Peer. Friends, relatives and neighbors served as an important confirmation mechanism, but in 43 percent of these cases, family members indicated that such sources either had no information, less information, or contradictory information than they had already obtained. (3) Self-Determined Confirmation. This included such actions as looking at the river and watching the actions of others. (4) Latent Confirmation. Some family members had the warning confirmed for them unintentionally, e.g., being stopped by a roadblock or receiving invitations from friends and relatives to come to their homes to escape the flood.

The fifth step, according to Williams scheme is interpretation of the warning message by the recipients and action by the recipients. A good indicator of whether the populace had received the warning message, and interpreted it as the senders intended, is the action or lack of action by, these recipients. As may be seen in a number of communities, the full meaning of the messages was not understood by the recipients. The almost holiday air of the spectator problem and the reluctance to evacuate in a number of communities is fair indication of the weakness of confirmation.

The sixth step, that of feedback to the issuers of messages, helped to save the day in more than one community, e.g., after the first evacuation warning was ignored, officials went back a second time with more forcefulness. Thus, the seventh step, that of new and corrected warning, was undertaken.

Implications

In this monograph warning and response have been reviewed, to a large extent, as a process. This process is carried out by people in a system, and the structure of that system is a contributing factor to the efficiency, or lack of efficiency, of the process. There are a number of areas in relation to structure that have implications for any evaluation and planning for the future.

Interorganizational Coordination

Interorganizational coordination was at different levels of efficiency in the various communities studied. Warning places a stress on the relevant organizations to get a job done under the pressure of strict time limitations. This places particular stress on interorganizational coordination. While a number of organizations perceive warning as falling within their scope of action, this report has demonstrated that the exact boundaries and extent of their responsibilities are not always clear. A fuller understanding of the possible services one organization may render to another, and a clearer understanding of the authority and responsibility of the various organizations that may be involved in response to disaster are needed. In relation to authority roles, a continuum seemed to develop from an administrative vacuum on one end to an unsanctioned assumption of authority leading to a duplication of effort on the other end. The following four reasons for these problems were explicitly suggested in the course of the various interviews: (1 and 2) leaders were gone from the community and unable to return, or in some instances, isolated on the field and not in easy communication with relevant organizations; (3) there was a lack of a clear conception of what a particular leader's role should be by both he and others; (4) personality factors of particular leaders and between leaders. A careful planning and rehearsal of emergency responses of relevant organizations would help to keep these problems to a minimum.

Role of the Public

The public's role in the warning process is considerably more than that of a passive receiver. A number of communities in this study experienced problems with spectators, traffic congestion, and refusal to evacuate that may be attributed to lack of positive response on the part of the public. Public education in disaster procedures is one answer to these problems, but it seems an incomplete one. In addition to public education, there is a need for more specific planning on the community and organizational levels. Out of the ten communities studied, the responsible agencies in the one community that had practiced operating on a disaster plan functioned at a high level of efficiency. They felt more capable of confronting the problems that arose and their actions were quite well integrated.

Desirability of a Disaster Plan

The desirability of a disaster plan that is more than a paper plan, is an implication that may be drawn from the data. A disaster experience, like the one attained through these floods, may sensitize organizations and communities to disaster and aid in better response; but it is not sufficient to assure that the organizational response will be adequate to meet future emergencies. A plan that outlines broad procedural steps and authority, and that is rehearsed, may be a big step in the direction of a high level of warning.

The Warning Process

The warning process, as noted in the body of the paper, may be analyzed in terms of its three stages of (1) forecast, (2) alert, and (3) confirmation. The data from the Colorado floods suggests the need for better equipment and more adequate staff to work in the area of detection, measurement, collation, evaluation, and transmission. The method and content of alert is also shown to be of importance. The stage that was continually found to be of critical importance in the towns studied was that of confirmation. This area is structural as well as procedural, but it is discussed in this section partly for convenience and because of the desire to set it apart.

Confirmation is attested to be an essential stage by any number of studies on warning. When people have been alerted that a disaster is happening they need to have it confirmed to them that it really is happening. There are a number of requirements for successful confirmation. The warning message -- i.e., the information received by a population in the process of confirmation -- should be (1) available via many channels, (2) immediate, (3) consistent, and (4) "official."

Depending on the time of day of the confirmation and the area of the country, or even the area within a particular city, one channel of communication may reach the population more readily than another. It has also been suggested that people who see confirming behavior from several sources and hear confirming messages on a repeated basis are more convinced of the authenticity of the alert. A radio station that goes to full-time coverage of a flood is more convincing in its confirmation than one that simply makes periodic announcements.

A second requirement is that the confirmation is immediate. People, after hearing the alert, will turn to another source for confirmation. A delay may be taken to mean the danger is not real or imminent.

The third requirement is that the message be consistent. It is probably impossible to rid all messages of all ambiguity and contradiction, but confirmation should seek to be as consistent and free from ambiguity and contradiction as possible. It may be helpful in this relation to establish a clearinghouse for information and a communication center that would send the same message over all channels.

People believe the impact of a serious warning message more readily when the source can be identified with organizations or individuals widely defined as "authoritative" and as "official." A message read by the sheriff will usually be taken more seriously than one read by a volunteer, a clerk, or even a disc jockey.

Warning is a process consisting of a number of interrelated activities and procedures in which a variety of groups, organizations, and individuals become involved. The various parts of this process are interdependent; they all contribute to one whole warning message -- the purpose of which is to elicit successful public response that will prevent, avoid, or minimize the danger.