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Bimal Kanti Paul

*Kansas State University, Manhattan, KS*

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## **FLOODING IN KANSAS: RESPONDENTS' SATISFACTION WITH EMERGENCY RESPONSE MEASURES AND DISASTER AID**

**Bimal Kanti Paul**

*Department of Geography  
Kansas State University  
Manhattan, KS 66506  
bkp@ksu.edu*

**ABSTRACT**—Several counties of south-central and southeast Kansas experienced floods in the first week of November 1998. The communities of Arkansas City and Augusta were among those most severely affected by these floods. This study is based primarily on a mail questionnaire survey of residents of these two communities, and it examines respondents' satisfaction with four emergency response measures employed by local officials and emergency management agencies before and during the flood event. The extent of external support victims received and the level of their satisfaction with that support were also investigated. The analysis of the survey data shows that the emergency response efforts and the support victims received were rated poorly. Furthermore, the satisfaction scores differed significantly between respondents from Arkansas City and those from Augusta. The findings suggest that the extent of damage and preparedness are directly associated with victims' satisfaction with emergency measures undertaken by emergency management agencies. The study further suggests that the respondents of Arkansas City were relatively more satisfied with emergency measures than their counterparts in Augusta. Unlike in Arkansas City, city officials in Augusta had little time to prepare for the flooding. Hazard preparedness appears to be an important determinant of victims' satisfaction with emergency measures.

**KEY WORDS:** emergency measures, external support, flash flood evacuation, flash flood watch, flash flood warning, floods, Kansas

### **Introduction**

Thirteen counties of south-central and southeast Kansas experienced flash floods in November 1998. Flash floods occur within six hours of the rain event and are characterized by a sharp rise in the water level followed by a rapid recession (NOAA/FEMA/ARC 1992; Smith and Ward 1998). The

1998 flash floods in Kansas forced hundreds from their homes and caused over \$37.8 million in damage, mostly in Butler, Cowley, and Sedgwick Counties (Paul 1999). Two dozen rivers and streams in the flood-affected counties flowed out of their banks on the first four days of November as a result of heavy rains that began on 30 October 1998. All 13 flood-affected counties were declared disaster areas by the state and three of them were later declared federal disaster areas by the president of the United States (Fig. 1). Butler, Cowley, and Sedgwick Counties, where more than 1,600 homes were flooded, suffered the most damage. In Butler County alone, over 800 homes, including 230 mobile homes, were damaged.

Several cities in the affected counties were inundated with flood waters, but Augusta in Butler County and Arkansas City in Cowley County suffered the most damage (Figure 1). The primary objective of this study is to examine residents' satisfaction with four emergency response measures employed by local officials and emergency management agencies in these two communities before and during the November 1998 flash flooding. The extent of external support victims received and the level of their satisfaction with that support are also investigated. Satisfaction levels are analyzed by community of residence, and by personal and/or household attributes of the respondents. The emergency measures considered are: the issuance of flood watches and flood warnings, evacuation, and other preventive measures such as sandbagging.

### **Flash Flood Research in the United States**

Flash floods are localized extreme events and are characteristic of steep stream slopes and impervious urbanized areas (Tobin and Montz 1994, 1997). Several factors contribute to flash flooding. The two key elements are intensity and duration of rainfall. Local atmospheric, topographic, and soil conditions, ground cover, and drainage basin characteristics also play an important role. Flash floods can occur within a few minutes or hours of excessive rainfall, dam or levee failure, or sudden release of water held by an ice jam (Bryant 1991). They can roll boulders, tear out trees, and destroy buildings and bridges, and trigger catastrophic mud slides. Fast-moving water associated with flash floods can even float cars.

Floods have been the most costly natural hazard in the United States in terms of deaths and loss of property and crops (Mileti 1999). Catastrophic floods have therefore received considerable attention from hazard researchers during the past several decades. Research on flood hazards in the United

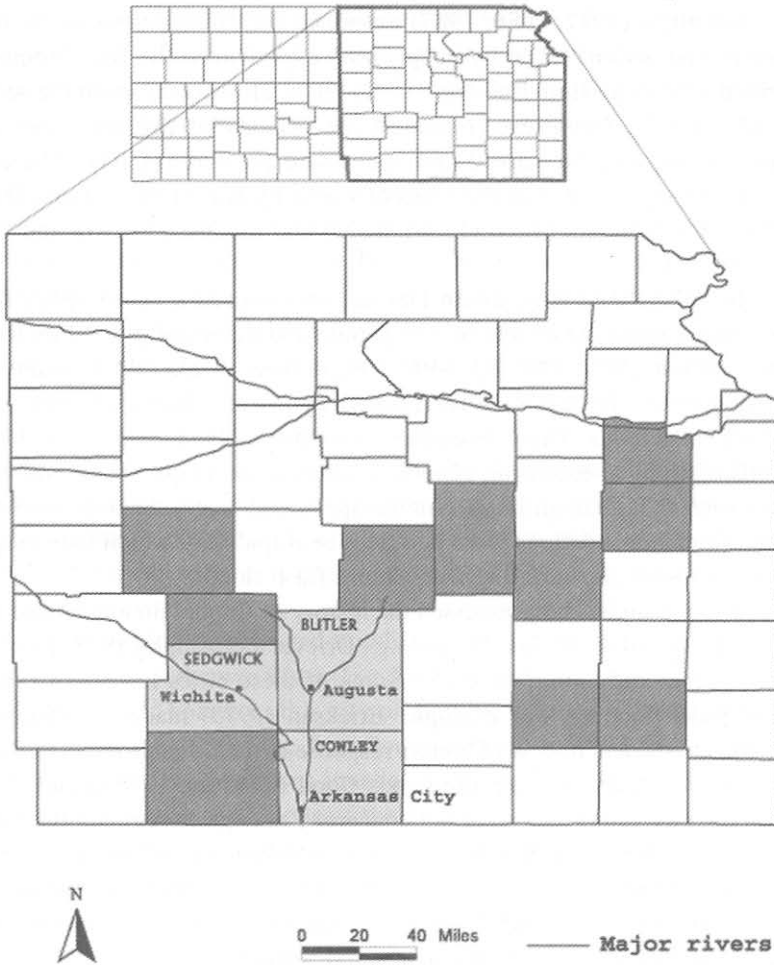


Figure 1. Location of the study area in Kansas. Shaded gray counties were declared state and federal Disaster Areas. Counties in black were declared a Disaster Area by the state.

States began with the pioneer work by White (1945), which ultimately led to the development of human ecological approach to hazard study (White 1974). While most flood deaths and damage in the country are due to flash floods (see NOAA/FEMA/ARC 1992), the research on this phenomenon has started only in the late 1970s.

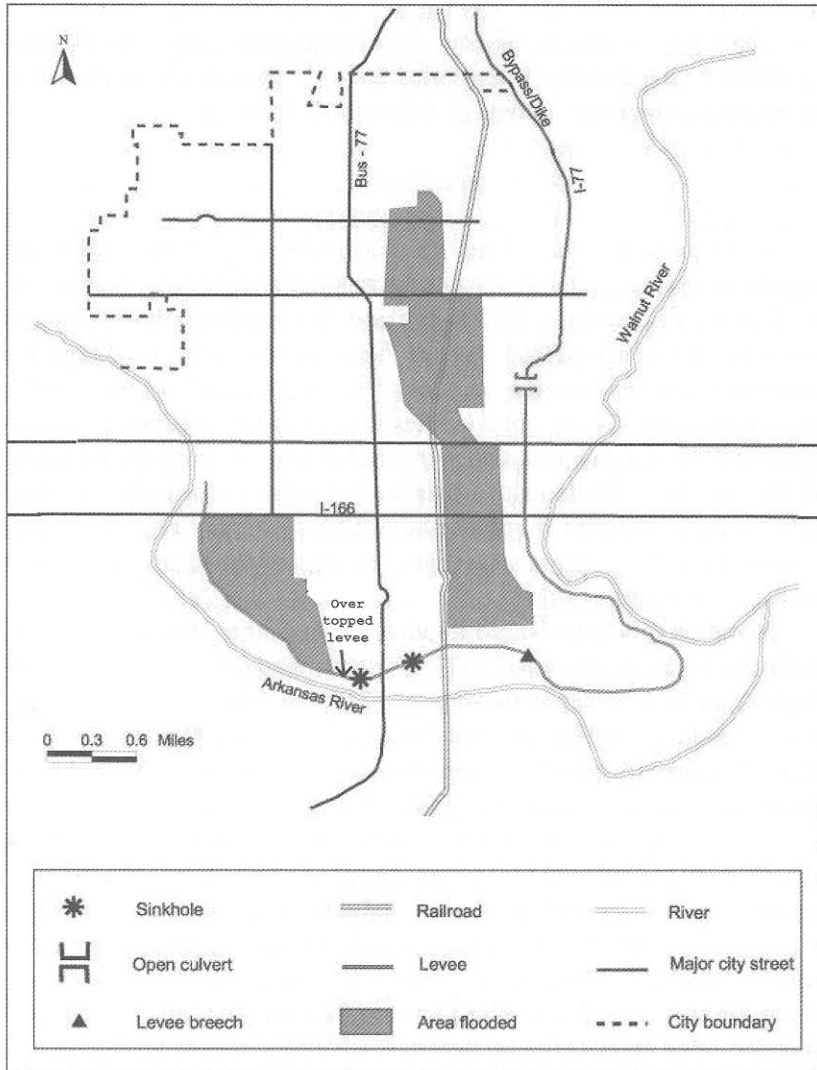


Figure 2. A Flood map of Arkansas City, Kansas.

of Arkansas City (Fig. 2). The floodwater started to recede from this and other parts of the city on 5 November 1998 (*Arkansas City Traveler* 1998).

The southwestern part of Arkansas City was flooded because the Arkansas River overflowed the dike, and an old levee near the river broke as

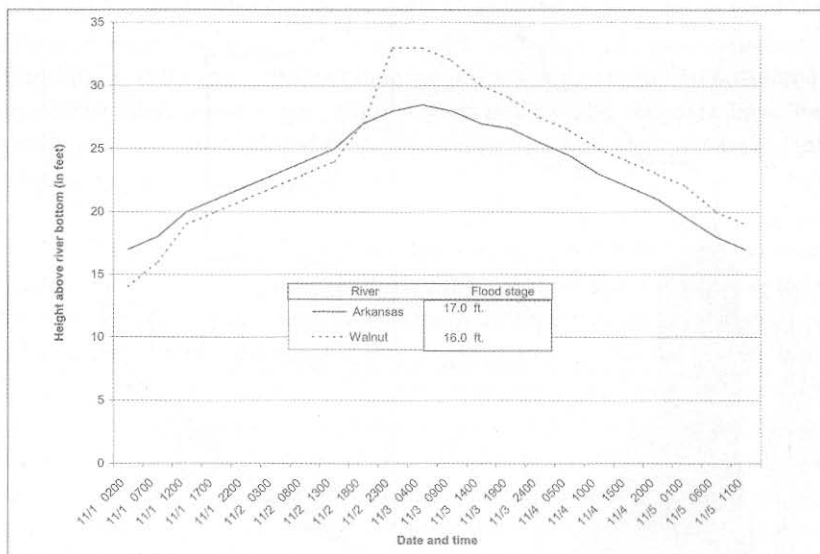


Figure 3. Flood readings on the Arkansas River and Walnut River, Arkansas City, 31 October-5 November 1998.

a result of prolonged exposure to high water (Fig. 2). There were several breaches and two sinkholes in the levee on the south side of the city. Under the new flood-protection plan, a new levee around the south side of Arkansas City is to be completed by 2004. Had it been completed before the 1998 flooding, it is likely that no areas in the southeast and southwestern parts of the city would have been inundated (*Arkansas City Traveler* 1998).

Augusta, population 8,700, also experienced flooding from two rivers: the Whitewater and the Walnut, whose waters topped a 35-foot (10.67 m) levee surrounding the town. The Whitewater river from the west and the Walnut River from the east converge immediately south of Augusta (Fig. 4). Both rivers reached a crest of about 37 feet (11.27 m) above river bottom, or 16 feet (4.87 m) above their flood stages of 21 feet (6.4 m) early in the morning of 2 November 1998 as a result of heavy rainfall that started at night on 30 October 1998. Hours ahead of the crest, parts of Augusta were already submerged by floodwater. Nearly 600 homes and 90 businesses were devastated by this flash flood and flood-related damage is estimated in excess of \$2 million (*Manhattan Mercury* 1998).

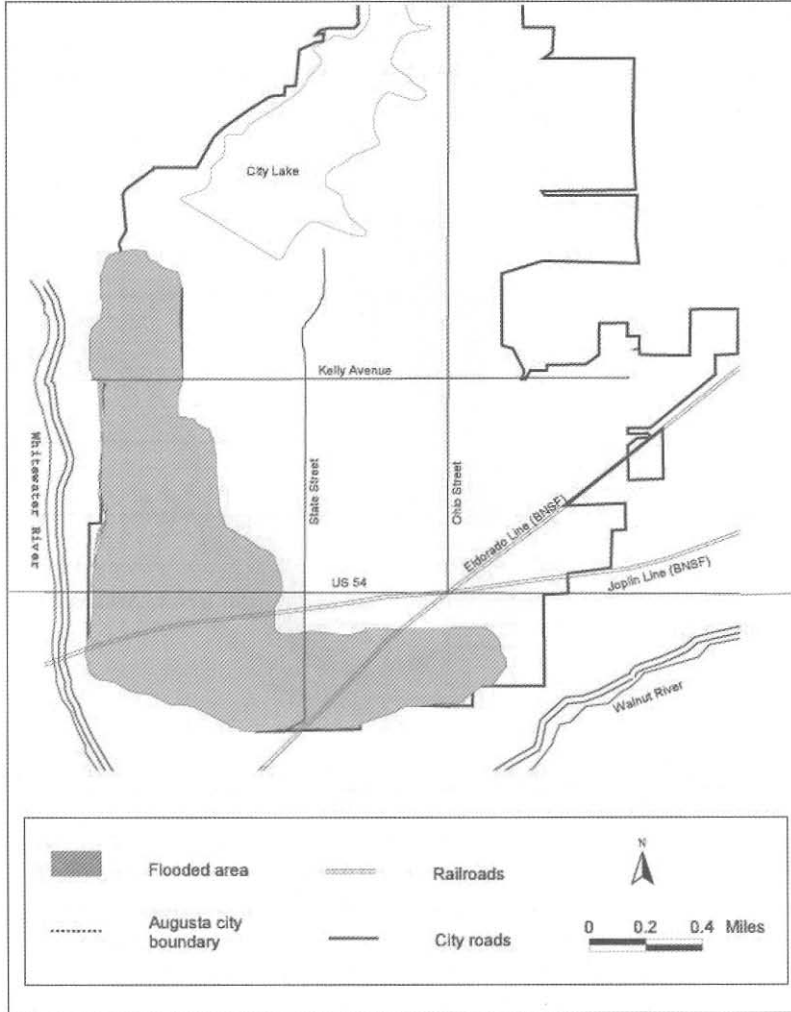


Figure 4. Flood map of Augusta, Kansas.

Floodwater entered Augusta at several locations and submerged parts of the city for about three days. The Whitewater River topped the levee on the southwest portion of the levee system and eventually eroded the levee from the inside. The central business district of the city was under 5 to 7 feet (1.52 to 2.13 m) of water. More than 300 homes and 30 businesses were evacuated in Augusta. The Red Cross established a shelter at the First

Christian Church where about 1,000 people took refuge for several days (*Kansas State Collegian* 1998). Like Arkansas City, Augusta experienced flooding in 1993 and 1995, but damage did not compare to that sustained in the 1998 flash flood event. Both Arkansas City and Augusta have been participating in the National Flood Insurance Program since the early-1990s (*Arkansas City Traveler* 1998).

*Sources of Data.* Analysis in this study is primarily based on a mail questionnaire survey conducted following the flash flood event, beginning in November 1998 and ending in March 1999. Relevant information was also collected through personal interviews with key personnel such as city officials, longtime city residents, and emergency management personnel. Assistant city managers of Arkansas City and Augusta provided maps of flood-affected areas, addresses of the flood victims, and other flood-related documents. Discussions and informal interviews with the managers and other key personnel were very useful in understanding and evaluating the emergency measures undertaken by both public and private agencies in the selected communities.

Personal opinions regarding the emergency response measures and the recovery activities of the affected areas were collected through the questionnaire survey. In addition to inquiring about overall satisfaction level with the emergency measures and support received, the questionnaire also requested information about the extent of damage incurred by the flood, the amount of emergency assistance provided by various organizations, and any adjustments made at the household level. Respondents were also asked to provide other information such as flood insurance status as well as selected household and individual characteristics.

According to the documents (City Office of Arkansas City 1998; City Office of Augusta 1998) provided by the city managers, there were 373 households in the flood-affected areas of Arkansas City and 338 in Augusta. Nearly two-thirds of the families in affected areas of both cities experienced damage from the 1998 flood. Since this study seeks personal opinions of both victims and nonvictims of the affected areas, these two groups of people were included in the questionnaire survey. This dictated a large sample size, which was also necessary because a low response rate was anticipated. Daily newspapers in eastern Kansas had reported that not all flood victims planned to return to their homes soon and that several people had already migrated to other cities (see *Arkansas City Traveler* 1998; *Manhattan Mercury* 1998).



A sample size of 200 for Arkansas City and 180 for Augusta was selected. Respondents were randomly selected from the address list provided by the city officials. Distribution of the questionnaire through the mail began the last week of January 1999, and the survey ended in the last week of March 1999. Within a week of the initial mailing, about 25% of the questionnaires were returned uncompleted because no one now lived at the specified addresses and forwarding addresses were unavailable to the postal service. Additionally, the address list provided by city officials contained several errors.

The return rate of incomplete questionnaires was 6% higher among mobile-home residents relative to occupants of single-family dwellings, duplexes, and multifamily apartment complexes. More mobile homes were affected by flash flooding in Augusta than in Arkansas City, thus the return rate of incomplete questionnaires was also 3% higher in Augusta than in Arkansas City. Since response rates do not differ significantly among different occupant groups and between affected and nonaffected groups, a nonresponse bias is unlikely to affect the results of this study. A second mailing of the questionnaire was directed to those respondents who did not return their questionnaire by the specified date and was needed in order to obtain a reasonable number of samples for this study. The analysis in this study is based on 128 usable questionnaires: 70 from Arkansas City and 58 from Augusta.

*Emergency Response Measures Selected.* Four activities were considered under the category of emergency response measures: the issuance of flash flood watches, the issuance of flood warnings, evacuation, and other related emergency measures—such as sandbagging and construction of emergency dikes. The issuance of a flash flood watch indicates flash flooding is possible within the designated watch area (NOAA/FEMA/ARC 1992). A flash flood watch usually alerts people in the area of concern and permits time for remedial activities such as moving furniture and valuables to higher floors of the home, and for preparing vehicles in case an evacuation order is issued (NDSU Extension Service 1999). After a flood watch is issued, people are advised to monitor TV and/or radio broadcasts for additional information, particularly the possibility of an upgrade of the watch to a flood warning.

A flash flood warning is issued when a flash flood is occurring or will occur very soon in the area of concern (NOAA/FEMA/ARC 1992). Loss of life and damage can be greatly reduced if the warning is issued in a timely

manner. Local emergency managers and the National Weather Service through local television and radio stations have the authority to issue a flood warning and advise people whether to evacuate or not. If an evacuation is ordered, people are advised to leave their homes as soon as possible and take refuge on higher ground away from rivers, streams, creeks, and storm drains.

Respondents' satisfaction with each of the four selected measures was examined using a 1-5 Likert Scale, in which 1 reflects the greatest dissatisfaction and 5 indicates the greatest level of satisfaction. A score of 3 infers that the respondent was neither particularly dissatisfied nor satisfied. The scale was also used to record the respondents' overall satisfaction level with emergency assistance received.

Although emergency measures were initiated in both selected communities by city officials, and similar types of private and public agencies responded, a comparative approach is used to examine whether the responses of the communities differ from each other with respect to each of the four emergency measures as well as with external support. Available studies (e.g., Blaikie et al. 1994; Bolin and Stanford 1998) suggest that the ability of a city to undertake emergency measures in a timely manner depends on city resources, which in turn depend on size, level of development, and location of the city. Small size, low level of development, and remote location are generally inversely related to the ability of a city to initiate adequate emergency measures. The two selected cities differ in location, size, and the level of development. They also differ with respect to time of onset and duration of the flood. Level of development is represented by variables such as annual income and level of education of the residents (Blaikie et al. 1994; Bolin and Stanford 1998).

Available hazard literature suggests that the differences in satisfaction with emergency measures and external support are a function of income, educational level, age, gender (see Gruntfest 1977; Haas et al. 1977; Blaikie et al. 1994), residential status of respondents in terms of location within the 100-year floodplain, past flood experience, and flood insurance status (see Tobin and Montz 1997; Mileti 1999). An average of all satisfaction scores of each respondent with the four emergency measures was calculated and rounded to the nearest whole number. This grand average score also ranges from 1 to 5, with 5 indicating the most satisfied score.

Chi-square tests of association were then used to test for differences between the satisfaction score and seven selected variables: annual income, educational level, age, gender, flood experience, flood insurance at the time

of flooding, and city of residence. Since flood insurance status and location of residence within the 100-year flood plain are highly related to each other ( $r = .78$ ), only the former is considered. A similar approach is adopted to test for differences in level of satisfaction with support received and the aforementioned variables.

*Characteristics of the Respondents.* Table 1 presents selected socioeconomic and demographic characteristics of the respondents. A majority (54.76%) of the respondents were female, and nearly 67% were married at the time of the survey. The age of the respondents ranged from 21 to 86, with a median age of 44. Forty-four percent of the respondents belonged to the 30-44 age group, and the age group labeled under 30 accounted for nearly 25% of all respondents. Nearly half of the respondents had a high school diploma and nearly one-fourth had an undergraduate degree; one-sixth of all respondents had a graduate degree.

Nearly 44% of the respondents were employed full-time at the time of the survey. Another 12% reported part-time employment. Some 27% of all respondents were retired and 17% were grouped under the "others" category, which included the unemployed, students, the disabled, and homemakers. The unemployment rate was very low in the study area. The modal gross family income was between \$20,000 and \$39,999 per year. Only 10% of the respondent households had a yearly income higher than \$59,999, and 31% earned less than \$20,000 annually.

Table 1 further shows that among all the respondents, 92 (71.88%) directly experienced flooding in 1998. This means that their homes were inundated and the flood caused damage to their property and belongings. The homes of the remaining 36 respondents (18.13%) were not flooded, but many of them reported that floodwater came very close to their homes. Only 17% of the respondents had flood insurance at the time of this flash flood event.

Among the eight socioeconomic and demographic characteristics reported in Table 1, five differ statistically between the two selected cities. They are: gender, age, education, income, and flood experience. While a majority of the respondents in Arkansas City were male, female respondents outnumbered male respondents in Augusta. Arkansas City respondents were younger in general and tended to have an elementary education relative to those from Augusta. The number of respondents who experienced flooding also differs between the two study sites (Table 1). Slightly over 83% of the Augusta respondents reported experiencing the flood compared with 62% for the respondents from Arkansas City.

TABLE 1  
SELECTED CHARACTERISTICS OF RESPONDENTS BY STUDY COMMUNITY

Characteristics	Number of respondents (%)		Total number <sup>a</sup> (%)
	Arkansas City	Augusta	
<b>Gender</b>			
Male	40 (58.82)	17 (29.31)	57 (45.24)
Female	28 (41.18)	41 (70.69)	69 (54.76)
	$\chi^2 = 11.006$ (d.f. = 1; $p = 0.001$ )		
<b>Marital status</b>			
Single	11 (16.18)	7 (11.86)	18 (14.17)
Married	45 (66.18)	40 (67.80)	85 (66.93)
Divorced	7 (10.29)	6 (10.17)	13 (10.24)
Widowed	5 (7.35)	6 (10.17)	11 (8.66)
	$\chi^2 = 0.717$ (d.f. = 3; $p = 0.869$ )		
<b>Age (years)</b>			
<30	23 (40.35)	4 (7.69)	27 (24.77)
30-44	25 (43.23)	23 (44.23)	48 (44.04)
45-64	4 (7.02)	15 (28.85)	19 (17.43)
>64	5 (8.77)	10 (19.23)	15 (13.76)
	$\chi^2 = 21.304$ (d.f. = 3; $p = 0.001$ )		
<b>Education (highest level completed)</b>			
Grade school	9 (13.24)	1 (1.72)	10 (7.94)
High school	32 (47.06)	28 (48.28)	60 (47.62)
Undergraduate	12 (17.65)	19 (32.76)	31 (24.60)
Graduate	9 (13.43)	9 (15.52)	18 (14.40)
Postgraduate <sup>b</sup>	5 (7.46)	1 (1.72)	6 (4.80)
	$\chi^2 = 8.507$ (d.f. = 3; $p = 0.037$ )		
<b>Employment</b>			
Employed full-time	26 (41.94)	27 (45.76)	53 (43.80)
Employed part-time	4 (6.45)	10 (16.95)	14 (11.57)
Retired	20 (32.26)	13 (22.03)	33 (27.27)
Others	12 (19.35)	9 (15.26)	21 (17.36)
	$\chi^2 = 4.432$ (d.f. = 3; $p = 0.218$ )		
<b>Income</b>			
<\$20,000	23 (40.35)	13 (22.41)	36 (31.30)
\$20,000-39,999	25 (43.86)	26 (44.83)	51 (44.35)
\$40,000-59,999	5 (8.77)	11 (18.97)	16 (13.91)
>\$59,999 <sup>b</sup>	4 (7.02)	8 (13.79)	12 (10.43)
	$\chi^2 = 6.373$ (d.f. = 3; $p = 0.037$ )		
<b>1998 flood experience</b>			
Yes	42 (61.76)	50 (83.33)	92 (71.88)
No	26 (38.24)	10 (16.67)	36 (28.13)
	$\chi^2 = 7.335$ (d.f. = 1; $p = 0.007$ )		
<b>Flood insurance at the time of flooding</b>			
Yes	14 (22.58)	5 (24.59)	29 (23.58)
No	48 (77.42)	46 (75.41)	94 (76.42)
	$\chi^2 = 0.007$ (d.f. = 1; $p = 0.935$ )		

Note:  $\chi^2$  = chi-square value, d.f. = degrees of freedom, and  $p$  = probability value.

<sup>a</sup>Not all respondents provided all personal information asked in the questionnaire and thus the number of responses will differ from one characteristic to another.

<sup>b</sup>Merged with "Graduate" category to calculate chi-square value.

## Results

Eighty-two (89.13%) of the 92 respondents who experienced flash flooding supplied a list of items damaged by the flood; 77 of them reported the amount of loss caused by the flood. Damage estimates provided by respondents amounted to a total of about \$2.24 million; this figure represents an average loss of \$29,000 per respondent. The reported extent of damage caused by the flood differs remarkably between the two study communities. Average flood damage, in monetary terms, was much higher for the respondents in Augusta (\$41,000) compared to those in Arkansas City (\$14,000).

As mentioned earlier, four emergency response measures were considered in this study. Respondents' satisfaction with these measures individually and collectively is examined in the following sections.

*Flash Flood Watch.* The flood watch was issued by the National Weather Service at 9:00 a.m. and 1:00 p.m. in Augusta and Arkansas City, respectively, on 1 November 1998. Respondents' satisfaction level with flood watch is presented in Table 2. It appears that 122 (95.31%) of the 128 respondents expressed their level of satisfaction with the flood watch. Sixty-two (50.82%) of them were very dissatisfied, while only six (4.9%) respondents were very satisfied with the flood watch alerts (Table 2). Importantly, 88 (72.13%) of the 122 respondents believed that either there was no flood watch issued in their neighborhoods or one was not issued in a timely manner. This might be one reason for the high level of dissatisfaction reported for the flood watch component of the emergency measures considered in this study.

Irrespective of their flood experience, all respondents were asked to rate their overall satisfaction level with the flood watches. The results suggest that the severity of flooding was negatively related to the satisfaction level of the respondents. Augusta was more severely affected by the flash flooding in 1998 than Arkansas City. The flood occurred more rapidly and stayed longer in Augusta than Arkansas City. Additionally, the field survey reveals that the city authorities of Augusta had little time to prepare for the imminent flooding. The waters inundated the community so suddenly and unexpectedly that authorities had little time for advance warnings. In the words of a respondent: "Everything happened fast—the levee broke fast, the water came fast, and rose fast."

For the above reasons, satisfaction is lower for the respondents from Augusta than for respondents from Arkansas City (Table 2). The chi-square

TABLE 2  
RESPONDENT SATISFACTION LEVEL WITH SELECTED EMERGENCY  
RESPONSE MEASURES

Satisfaction level	Flood watch	Flood warnings	Flood evacuation	Other emergency measures	All measures
1	62	71	54	42	26
2	17	15	20	15	41
3	25	15	25	27	26
4	12	15	17	21	16
5	6	6	6	17	2
Total	122 <sup>a</sup>	122	122	122	111 <sup>b</sup>
Average score					
Study area	2.04	1.93	2.19	2.64	2.34
Arkansas City	2.38	2.24	2.35	2.81	2.61
Augusta	1.64	1.57	2.00	2.45	2.00
$\chi^2$ -value (d.f./p)	12.063 (3/0.007)	7.416 (3/0.060)	2.892 (3/0.409)	2.519 (4/0.640)	9.417 (3/0.024)

<sup>a</sup>122 of the 128 respondents expressed their satisfaction level with the four selected emergency measures considered in this study. But not the same 122 respondents expressed their satisfaction level with each one of the selected measures.

<sup>b</sup>Only 111 respondents expressed their satisfaction level with all four selected emergency measures.

test demonstrated a highly significant difference between respondents of these two cities with respect to the overall satisfaction level with the flood watch alert. In Table 2, respondent satisfaction levels are not disaggregated by study site because, with the exception of the flood watch alert, the remaining measures did not differ significantly between the two study sites (Table 2).

*Flash Flood Warning.* In addition to the dissemination of flood warnings through TV and radio, police, fire department, and civil defense personnel delivered flood warning bulletins and flyers to residents of several low-lying areas in both Arkansas City and Augusta. The dissemination began at 2:30 p.m. in Augusta on 1 November 1998 and at 3:00 p.m. in Arkansas City on the following day. Nearly three-fourths of the respondents surveyed were not pleased with the flood warning component of the emergency response measures considered in this study. Of the 122 respondents

who did rate their satisfaction level, 71 (58.20%) were very dissatisfied, while only six respondents (4.92%) were very satisfied with the flood warning (Table 2). The average satisfaction score for the flood warning is 1.93, signifying that the respondents of both cities were displeased. Similar to the response for flood watches, the average level of satisfaction with flood warnings was higher for the respondents from Arkansas City than those from Augusta; however, the difference was not statistically significant at the  $p < 0.05$  level (Table 2).

Several respondents from Arkansas City claimed that the city authorities knew several hours in advance that certain parts of the city were going to be flooded, but deliberately informed people that they had nothing to worry about in order to avoid creating a panic situation. Nearly three-fourths of the respondents in both communities studied reported that there was no flood warning in their area or it was not delivered in a timely manner. Several respondents from Augusta reported that they called the city office and the local radio station during the evening hours of 1 November 1998 regarding flood warnings but did not receive any useful information from them. Conversely, a considerable number of respondents in both cities ignored the warnings that were issued and did nothing to safeguard their property and belongings. All of them were very dissatisfied with the flood warning component of the emergency measures considered in this study.

A number of respondents in both cities saw police or other city officials in the vicinity, but these personnel did not instruct anyone to leave the area nor was instruction given about what to do in the event of flash flooding or where to go for shelter. Several respondents acknowledged receiving a flood warning, but felt that their houses were far enough from the flood-prone areas that they did not take any action. An overwhelming majority of the respondents thought that authorities of both cities failed to caution residents regarding the flash flooding. Some respondents from Augusta suggested that if the fire or tornado siren had sounded, more people would have been alerted. But Augusta city policy is to activate the storm sirens only in the case of a tornado, and if the city would have sounded the siren, some residents in the affected areas may have gone into their basements and may not have been able to get out.

*Flash Flood Evacuation.* The evacuation of people from flood-affected areas started about 11:30 pm on 1 November 1998 in Augusta and in the early morning hours on 3 November 1998 in Arkansas City. Rescue teams evacuated families from their homes by boats in both cities and

victims were taken to flood shelters set up at two churches by the American Red Cross—one in Arkansas City and the other in Augusta. Nearly one dozen organizations including the Red Cross, the Salvation Army, the Lions Club, area churches, city police, the fire department, and the Army National Guard were involved in the flood evacuation process. Friends and relatives also helped many respondents evacuate their property.

The questionnaire survey shows that of the 128 respondents, 105 (82.03%) had to evacuate their homes as a result of the flooding. The evacuation rate was nearly 10% higher among the respondents in Augusta compared to those in Arkansas City. All the respondents who evacuated their residences were asked about the location and nature of their temporary accommodations. As has been found in previous studies (e.g., O'Brien and Payne 1997; Mileti et al. 1992; Dymon 1999), friends and relatives were the major source of the temporary accommodations provided for evacuees of both cities. Fifty-nine respondents (56.19%) stayed and/or were still staying with friends and relatives at the time of the survey. Twenty evacuees found accommodations with their parents or other family members and nineteen stayed in motels. Only 10 respondents stayed in flood shelters; the remaining respondents lived in rented apartments or in trailer parks. Most of the evacuees stayed within a five-mile radius of their homes. Nearly half of the respondents who stayed in motels and flood shelters were there for several days before moving in with friends and relatives or to rented apartments.

The survey indicates that respondents who evacuated their property lived on average about 20 days outside their homes. Eighty-four (80%) of the 105 respondents who were required to evacuate stayed elsewhere before returning to their homes. While away, these respondents returned periodically to repair their damaged homes. Of the evacuees, 10 respondents were still living with their friends or relatives at the time of questionnaire survey. The average length of stay outside the home was six days longer for the respondents from Augusta than those from Arkansas City.

Irrespective of flood experience and evacuation status, all respondents were asked to express their satisfaction with the flood evacuation efforts using the five-point Likert Scale. The average score was 2.19, indicating that a majority of respondents from both sites were generally dissatisfied with the way the two selected cities handled the evacuation (Table 2). Specifically, respondents from Augusta were more dissatisfied with evacuation measures than those from Arkansas City. Nearly two-thirds of all respondents indicated that the flood evacuation was not as effectively executed by authorities as it could have been. Ten respondents evacuated



themselves after their friends told them that the dike had broken. Three respondents evacuated their mobile homes because the gas line was disconnected by the gas company. Most respondents, however, expressed general satisfaction with evacuation efforts undertaken by the Red Cross, Salvation Army, and area churches.

*Other Emergency Measures.* Other emergency measures undertaken by various organizations before and/or during the flooding included sandbagging, traffic control, and food distribution to flood victims. In addition to the various emergency management agencies and city departments, area churches, local and national voluntary organizations, and local businesses participated in these emergency measures as did individual residents of Arkansas City, Augusta, and neighboring communities.

The survey indicates that nearly 25% of all respondents participated in other emergency measures. Several respondents wrote that they could not participate because they were preoccupied with saving their belongings, while others had no time to do so. Although no statistically significant variation was observed with respect to participation in other emergency measures between the respondents of the two selected cities, the survey data show that the participation rate was slightly higher among the respondents who did not experience flooding compared to those who did.

Levees were constructed along the two rivers passing through Arkansas City and Augusta to protect these cities from flooding. While undertaking emergency response measures, city officials in Arkansas City feared that floodwater might top the levees at several points and they also identified weak spots on the levees where breaching might occur. It was then deemed necessary to raise the height of levees and enhance the strength of the levees in several places. City personnel in Arkansas City and others participated in filling sandbags and stacking them on levees. The National Guard was mobilized to aid in the levee work in both cities and approximately 40 members of the nearby Winfield Correctional Facility were also utilized in Arkansas City. Many individuals also attempted to protect their residences by constructing sandbag diversions.

City authorities in Augusta were not aware of any threat that floodwaters would top the levee because they relied upon the information provided to them by the National Weather Service. The information stated that the crest would be several feet below the top of the levee and would occur 24 hours later. It actually topped the levee by two feet and crested 18 hours earlier than predicted. As for identifying weak spots in the levee, city

themselves after their friends told them that the dike had broken. Three respondents evacuated their mobile homes because the gas line was disconnected by the gas company. Most respondents, however, expressed general satisfaction with evacuation efforts undertaken by the Red Cross, Salvation Army, and area churches.

*Other Emergency Measures.* Other emergency measures undertaken by various organizations before and/or during the flooding included sandbagging, traffic control, and food distribution to flood victims. In addition to the various emergency management agencies and city departments, area churches, local and national voluntary organizations, and local businesses participated in these emergency measures as did individual residents of Arkansas City, Augusta, and neighboring communities.

The survey indicates that nearly 25% of all respondents participated in other emergency measures. Several respondents wrote that they could not participate because they were preoccupied with saving their belongings, while others had no time to do so. Although no statistically significant variation was observed with respect to participation in other emergency measures between the respondents of the two selected cities, the survey data show that the participation rate was slightly higher among the respondents who did not experience flooding compared to those who did.

Levees were constructed along the two rivers passing through Arkansas City and Augusta to protect these cities from flooding. While undertaking emergency response measures, city officials in Arkansas City feared that floodwater might top the levees at several points and they also identified weak spots on the levees where breaching might occur. It was then deemed necessary to raise the height of levees and enhance the strength of the levees in several places. City personnel in Arkansas City and others participated in filling sandbags and stacking them on levees. The National Guard was mobilized to aid in the levee work in both cities and approximately 40 members of the nearby Winfield Correctional Facility were also utilized in Arkansas City. Many individuals also attempted to protect their residences by constructing sandbag diversions.

City authorities in Augusta were not aware of any threat that floodwaters would top the levee because they relied upon the information provided to them by the National Weather Service. The information stated that the crest would be several feet below the top of the levee and would occur 24 hours later. It actually topped the levee by two feet and crested 18 hours earlier than predicted. As for identifying weak spots in the levee, city

officials claimed that there was never a concern that the levee would fail. After it was topped at the south end, their concern was that it would top at other points around the community. City personnel in Augusta did fill sandbags and place them in strategic locations, but not on levee tops, for additional protection.

All areas of Arkansas City and Augusta that were already flooded or had a high potential for flooding were blocked to traffic, and many roads into these two towns had to be closed for several days because of the high water. Individual volunteers and the National Guard were employed to help divert traffic from flooded and/or flood-prone areas. The latter also helped to patrol the dike to check for breaches or seepage and to protect evacuated property.

The average satisfaction level with other emergency measures is less than three, indicating that the respondents as a group were less than satisfied (Table 2). Respondents indicated that the other emergency measures undertaken were less than adequate and not initiated in a timely manner. Among the four emergency measures considered in this study, the category of other emergency measures received the highest average satisfaction rating, followed by flood evacuation, flash flood watches, and flash flood warning. However, all the scores remain below three, which suggests that respondents in general were not satisfied with the measures taken.

The average overall satisfaction scores of all four emergency measures considered in this study are calculated for seven selected respondent characteristics: annual income, educational level, age, gender, flood experience, flood insurance status at the time of flooding, and community of residence. But the score differs statistically only in the case of the last variable. For this reason, Table 2 presents satisfaction scores only by study sites. Respondents in Arkansas City were more satisfied compared to their counterparts in Augusta, but the average score for both communities is less than three, indicating that respondents were less than satisfied with the performance of city officials and emergency response agencies as a result of the flood of November 1998.

One important reason for widespread dissatisfaction with emergency response efforts in the study area was that respondents did not expect any flooding to occur, and most city residents were not prepared for it. The reason, in part, was that the levees generated a false sense of security in residents, and many perceived that the threat of flooding had been eliminated through construction of the levees. Unfortunately, some of the levees were over 40 years old, and a considerable number of respondents from both

study sites complained that many levees were not properly maintained. City officials in both selected cities, however, denied this complaint.

All indicators, including extent of damage incurred, evacuation rate, and length of stay outside damaged homes, suggest that Augusta suffered more from the November 18 flash flood than Arkansas City. City officials in Augusta had little time to prepare for the flooding, but city authorities in Arkansas City had 24 to 36 hours to organize emergency response plans. Arkansas City is located about 50 miles (75 km) directly south of Augusta. Both cities were flooded by two rivers; one of them (the Walnut River) was a source of flooding for both cities. City officials in Arkansas City closely monitored the water level of the Arkansas and Walnut Rivers. They reportedly contacted a majority of the residents in the 100-year floodplain as well as some residents in other parts of the city and warned them in advance.

Since Arkansas City is larger than Augusta, it has more manpower to implement emergency measures relatively quickly and efficiently than Augusta. The size of city seems to be positively associated with satisfaction level, and the amount of flood damage experienced by respondents appears negatively associated with satisfaction level. Per capita losses in Augusta were about three times higher than in Arkansas City. Additionally, the number of respondents who experienced flooding was significantly higher in Augusta than in Arkansas City. All these may help explain why the average overall satisfaction scores statistically differed among the respondents of the two selected cities.

*External Support Received and Level of Satisfaction with the Support.*

Analysis of the survey data reveals that 81 (88.04%) of the 92 respondents who experienced flooding received support, often from multiple sources. The largest number of flood victims (92%) obtained support from volunteer organizations, followed by government disaster programs (78%). The remaining three sources (insurance, business, and others) provided support to less 20% of all respondents. The satisfaction rankings of these three sources differ between the two study sites (Table 3).

Among volunteer organizations, the Red Cross, Salvation Army, and area churches played a dominant role in providing support for flood victims in both cities. Respondents also received support from several government disaster programs, and the Federal Emergency Management Agency and Small Business Administration actively participated in distributing emergency assistance among flood victims. To make it easier for flood victims to obtain information and help, the Federal Emergency Management Agency

TABLE 3  
RESPONDENT SATISFACTION LEVEL WITH EXTERNAL SUPPORT

Satisfaction Level	Arkansas City	Augusta	Total
1 (very dissatisfied)	4	10	14
2 (dissatisfied)	1 <sup>a</sup>	11	12
3 (neither satisfied nor dissatisfied)	15	10	25
4 (satisfied)	8	9	17
5 (very satisfied)	7	9	16
Total	35	49	84 <sup>b</sup>
Average score	3.29	2.91	3.07
$\chi^2$ -value	9.074 (d.f. = 3; $p = 0.028$ )		

<sup>a</sup>Merged with satisfaction level 1 to calculate the chi-square value.

<sup>b</sup>Among 92 respondents who experienced flood damage, 84 received external support.

and the Kansas Division of Emergency Management established a Disaster Recovery Center in Augusta.

The type of support received by flood victims included cash, checks, low interest loans, credit utilities, food, cleaning supplies, furniture, rental assistance, and clothing. Additionally, the Red Cross and Salvation Army provided flood victims with vouchers to purchase clothing, food, and other items to meet emergency needs. Often disaster victims suffer from depression and stress for many days following an event, yet not a single respondent indicated they had received counseling. Three respondents, however, reported that their children had a difficult time after the flooding because the flood damaged their toys. The assistant city manager of Augusta claimed that many physicians and churches notified the city that they were willing to provide counseling to the community. City staff members did a followup inquiry on the amount of counseling provided to victims and, surprisingly, very little assistance was requested.

When expressed as a dollar value, all support received by the respondents totaled about \$590,000, which represents only 26% of the total damage reported by the respondents. In Arkansas City the actual monetary support received was only 23% of the amount of damage reported by the respondents; Augusta received 28%. Respondents in Augusta suffered more damage from the flooding and consequently received greater support in

terms of monetary value than respondents in Arkansas City. But the ratios of aid to losses are similar in both communities. Note that all respondents who experienced flood damage did not report the amount of support received; therefore, the actual amount of support received is likely higher than the reported amount.

Government sources rank first with respect to amount of support provided to the flood victims, accounting for slightly over 64% of all support received, followed by insurance companies, volunteer organizations, businesses, and other sources. As noted earlier, volunteer organizations provided support to the largest number of victims, yet these organizations as a group rank third behind government sources and insurance companies in terms of value of the support offered (Fig. 5A).

Ranking and relative contribution by the four broad sources of support considered in this study differ between the two study sites. In Arkansas City, government emergency agencies provided as much as 81.6% of the total value of all support received, but in Augusta only 60.16% (Fig. 5B and 5C). The contributions of insurance agencies, business firms, and other groups as sources of support to flood victims was lower in the Arkansas City relative to Augusta. This may explain why government sources provided a higher proportion of support to the respondents of Arkansas City than those of Augusta.

Many respondents thought that the compensation they received for reported losses was inadequate. As noted earlier, the various sources of support were able to compensate only 26% of the total reported losses. For this reason, flood victims had to make adjustments to their household income level to compensate for damages caused by the flood. As many as 61 (66.3%) of the 92 respondents sold belongings, property, or spent previous savings to mitigate flood damage. A number of respondents also borrowed money from their friends and close relatives, and several respondents used credit cards to defray expenses. This finding is consistent with existing literature which suggests that victims bear the major share of losses caused by a natural disaster and they aid themselves in coping with extreme events (see White 1974; Burton et al. 1978; Smith 1992; Hewitt 1997).

Typical of most natural disasters, some discontent was found with the official response to this flash flood event (see Tobin and Montz 1994). As many as 26 respondents expressed dissatisfaction with the services provided by FEMA. Specifically, most complained that it was hard to contact FEMA personnel. They further criticized the slowness of the process required to receive payments and the incredible amount of documentation required. Several respondents directed animosity in their remarks at Red

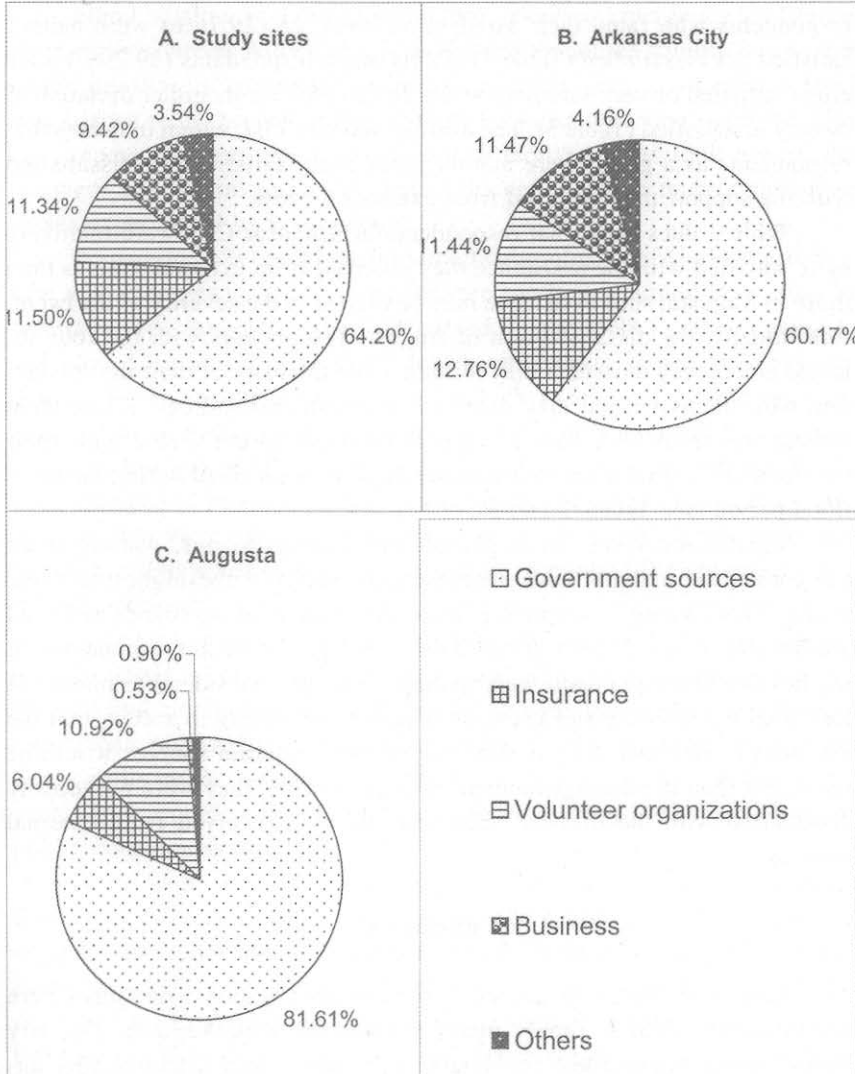


Figure 5. The percentage contribution of major sources to the total amount of support received by respondents.

Cross personnel. In contrast, many flood victims stated great appreciation for the assistance provided by the Salvation Army and area churches.

Respondents were asked to rate the overall satisfaction level with the support they received from external sources. The level of satisfaction significantly differed only in the case of the community of residence. Of the 84

respondents who rated their satisfaction level, 25 (29.76%) were neither satisfied nor dissatisfied (Table 3). Thirty-three respondents (39.29%) were either satisfied or very satisfied, while 26 (30.95%) were either dissatisfied or very dissatisfied (Table 3). The average score is 3.07, which indicates that respondents as a group were neither particularly satisfied nor dissatisfied with the support they received from external sources.

Table 3 does show that respondents in Arkansas City were relatively more satisfied with the assistance they received from external sources than those in Augusta; such assistance may be related to the severity of the event. Additionally, the dissatisfaction of Augusta respondents with the four selected emergency measures may influence the intensity of their dissatisfaction with the assistance they received from external sources. Respondent satisfaction level with four emergency measure is consistent with their satisfaction level with the external assistance they received during the post-flood period (see Tables 2 and 3).

Satisfaction levels were placed into five categories. Among these categories, the external assistance category received the highest average rating. This finding is surprising since the amount of assistance received accounted for only 26% of the total damage reported by the respondents. It implies that the respondents were willing to accept a considerable amount of loss from the flooding and knew, or at least were willing to accept, that the amount of assistance they would receive from external sources would be much less than the damage incurred. For this reason, they were not terribly dissatisfied with the disaster relief and aid they received from external sources.

### **Conclusion**

Results of this study indicate that emergency response measures were not implemented in a timely manner, particularly in Augusta. The city authorities in Augusta had few hours to prepare, while Arkansas City authorities had more than 24 hours. Since Arkansas City is located about 50 miles directly south of Augusta, Arkansas City officials knew that flooding would also affect their city. Therefore, those officials closely monitored the water levels of the Arkansas and Walnut Rivers. It appears that both cities could have been equally prepared, but the short lead time created problems for Augusta. There is also a size advantage for Arkansas City. Because it is larger than Augusta, Arkansas City had more personnel to prepare for the flood.



Flood victims in both communities received emergency assistance from many sources. Although this assistance amounted to only one-fourth of the total losses reported by respondents, their overall satisfaction level was higher with the amount of support they received than with the four emergency response measures. Various federal agencies took part in the recovery and federal assistance played the major role in mitigating hazard losses experienced by respondents.

Preparedness is one of the important determinants of victims' satisfaction with emergency measures undertaken by the concerned authorities in the study area. Augusta was less prepared for the 1998 flood compared to Arkansas City and thus received lower satisfaction scores from respondents. This is an important finding for both public and private agencies involved in predisaster mitigation efforts. This study suggests that respondents' characteristics were not strongly related to their satisfaction levels with emergency measures employed by local officials. The findings also indicate that the extent of preparedness of a community from a potential flood hazard depends on lead time available to public officials and the size of the community.

In order to reduce damage caused by flooding in the future, officials need to adopt a comprehensive flash flood watch and advanced warning system, and implement a public awareness and preparedness campaign. Emergency preparedness officials should also consider conducting emergency drills and/or initiate a flash flood awareness week or month every year, which would be beneficial in keeping the risk of flash flooding in the public consciousness.

At the same time, individuals must also act rationally if an emergency does arise. Extensive public education may be useful, or even necessary, in reducing the tendency to disregard a flash flood watch and/or warning. Future research should examine the role of local officials in dealing with the risks and uncertainties posed by extreme natural events. Problems confronted by officials in organizing emergency responses to an impending natural event may also be an important focus for future study.

Although results of this study suggest that respondents were not satisfied with the emergency response measures undertaken before and/or during the flash flood event, no attempt was made to ask respondents why they were not satisfied. This study further suggests that the respondents in general were not satisfied with most organizations involved in distributing disaster assistance among the flood victims. However, many respondents greatly appreciated the efforts of several organizations. Instead of seeking

overall satisfaction level, future studies should consider respondents' satisfaction levels with each of the major agencies that participate in dispersing disaster relief. Such studies will provide helpful insights to relevant authorities in preparing and managing future flood hazards in small communities.

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