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Engineer Institute for
Water Resources

Estimate of Flood-Related Human Costs in the 1983 Flood at Jackson, Mississippi

IWR Special Study for the Mobile District

May 1984

Reimbursable Study 84-RS-2

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At the request of the Mobile District (SAM), the Institute for Water Resources (IWR) conducted a survey of households that were flooded by waters of the Pearl River in May 1983. The research was designed to measure human suffering that resulted from the 1983 flood event. The record of human costs developed through the survey provides a unique opportunity to assess flood trauma damage from two flood events that affected the same community. The initial survey was conducted following the Easter 1979 flood. The survey data are for use in the benefit-cost analysis for flood abatement measures being studies by SAM.

ESTIMATE OF FLOOD-RELATED HUMAN COSTS
JACKSON, MISSISSIPPI
FLOOD OF APRIL 1983

Prepared for the

Mobile District

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Introduction

1. At the request of the Mobile District (SAM), the Institute for Water Resources (IWR) conducted a survey of households that were flooded by waters of the Pearl River in May 1983. A team of three researchers, two from IWR and one from SAM, completed the survey during the third week of March 1984. The research was designed to measure human suffering that resulted from the 1983 flood event. The survey data are for use in the benefit-cost analysis for flood abatement measures being studied by SAM.

2. The record of human costs developed through the survey provides a unique opportunity to assess flood trauma damage from two flood events that affected the same community. The initial survey was conducted following the Easter 1979 flood. Approximately 500 households responded to 100 questions that pertained to social, psychological, and physical health consequences of flooding. The second survey on effects of the 1983 flooding used 24 of the trauma index questions which were asked originally. The sample of 104 households was randomly selected from a list of 295 street addresses which had been used following the 1979 event. To achieve geographical, racial, and socioeconomic distribution, the survey included houses located in the northeast Jackson, south of downtown and east of the Pearl River in Flowwood, and mobilehomes in the vicinity of Ross Barnett Reservoir. The percentage of households in each area is: northeast Jackson 83%, south of downtown 11%, mobilehome park 1%, and Flowwood 5%. No commercial or industrial activities were included in the sample.

3. Initially every second or third address on a given street was selected for inclusion in the sample. As a result of several problems, the interviewers were not always able to conform to the pattern originally selected. Selection of other households on a street became necessary when (1) after repeat visits no one could be found at home, (2) the house was not flooded in 1983 or (3) the present occupant (usually a renter) had not lived in the house during the 1983 flood. Residents for the most part were very cooperative about answering questions.

4. Although the survey was not designed to measure economic and physical effects, the interviewers learned some general information that is included here. Residential neighborhoods are changing from owner occupied to rentals. As a result of flooding and threats of flooding, many houses in northeast Jackson that previously were owner occupied now are rental. In the residential area south of downtown, many houses that were included in the 1979 survey have been torn down, leaving debris-strewn vacant lots. Throughout the flood prone area, property values have dropped significantly and many owners would like to sell. But despite the recent floods, new residential development is continuing in the flood plain adjacent to an area that received destructive flooding in both 1979 and 1983.

5. Many people interviewed are confused about the role of the Corps of Engineers and the local political entities. All are extremely impatient over the lack of progress and fear the next threat of rising water.

Trauma Index

6. Each response in the post-1983 Flood Survey was scored on 20 AMA--comparable symptom indicators of traumatic experience. This survey was conducted by Thomas Ballentine, Kevin Alexander, and Dr. Claudia Rogers of the Mobile District in March 1984. The analysis was conducted by Dr. Lloyd G. Antle, Dr. Charles E. Simpkins, and Mr. David Grier of the Institute for Water Resources. The sum of the scores for each response was then computed for each household (maximum is 20). For this survey, the majority of the cases fell into the middle range of the trauma scale. As was done in the Tug Fork report[1/], the trauma scale is empirically divided into three classes: (1) limited trauma damage (2) moderate trauma damage and (3) severe trauma damage. Table 1 shows the results of this division of cases.

TABLE 1

TRAUMA SCORE CLASSIFICATION
JACKSON, MISSISSIPPI
DAMAGE SURVEY FOLLOWING APRIL 1983

TRAUMA SCORE	NO. OF CASES	FREQUENCY (PERCENT)
1-8 (Class I)	25	24.0
9-12 (Class II)	61	58.7
13-20 (Class III)	18	17.3

7. Since two other human cost of flooding studies have been conducted, it is enlightening to compare the three situations. Each of the communities have significantly different flooding conditions (velocity, depth, duration, debris, transport, etc.) land use, and socioeconomic, and historic characteristics of flood plain occupants. The results at Jackson correspond with inferred expectations based on these attributes. A significantly higher percentage of the trauma scores are in the middle range, and fewer are in the severe trauma effects class than was true in the more volatile flood in the Tug Fork Valley. Table 2 compares the percentage of individuals in each trauma effects class in the three studies.

TABLE 2

COMPARISON OF PERCENTAGE OF INDIVIDUALS IN EACH
TRAUMA EFFECT CLASS
TUG FORK, LAKE ELSINORE, AND JACKSON

	I	II	III
TUG FORK, WEST VIRGINIA & KENTUCKY	30.0	41.0	29.0
LAKE ELSINORE, CALIFORNIA	24.6	56.4	19.0
JACKSON, MISSISSIPPI (1979 Flood)	15.8	65.3	18.9
JACKSON, MISSISSIPPI (1983 Flood) Low Bound	26.0	51.0	24.0
JACKSON, MISSISSIPPI (1983 Flood) High Bound	16.3	60.6	23.1

1/Appendix E, "Human Costs Assessment, The Impacts of Flooding and Nonstructural Solutions, "Phase I, General Design Memorandum, Tug Fork Flood Damage Reduction Plan (April 1980), Prepared by: Lloyd G. Antle and Charles E. Simpkins, et al, US Army Corps of Engineers, Institute for Water Resources.

8. The trauma score classes (representing severity of damage) are related to "impairment of the whole person" monetary compensation given by the Veterans Administration for psychological trauma-related impairment of Veterans. For the 1983 flood we have developed "low bound" and "high bound" estimates which are distinquished by the trauma index value assigned to man-hours of cleanup. The "low bound" uses the mean value of the data from the 1979 flood of 336 hours. The "high bound" reflects the index values resulting from using the means of the 1983 flood survey of 80 hours. The monetary damage estimate for each class is based on the values developed in the Tug Fork report, adjusted to the October 1984 price level by the Medical Cost Price Index reported in the Survey of Current Business (US Department of Commerce). Tables 3 and 4 show the monetary value of the flood related trauma damage for the April 1983 flood in Jackson, Mississippi.

TABLE 3

TRAUMA DAMAGE PER PERSON
JACKSON, MISSISSIPPI
APRIL 1983 FLOOD
(LOW ESTIMATE)

	PERCENT IN CLASS		DAMAGE FOR CLASS		WEIGHTED DAMAGE PER PERSON
CLASS I	24.0	X	$0	=	$0
CLASS II	58.7	X	$1,326.60	=	$ 778.71
CLASS III	17.3	X	$4,315.20	=	$ 746.13
					$1,524.84 in 1979 dollars
					$2,567.07 in Oct. 1984 dollars

TABLE 4

TRAUMA DAMAGE PER PERSON
JACKSON, MISSISSIPPI
APRIL 1983 FLOOD
(HIGH ESTIMATE)

CLASS	PERCENT IN CLASS		DAMAGE FOR CLASS		WEIGHTED DAMAGE PER PERSON
CLASS I	16.3	X	$0	=	$0
CLASS II	60.6	X	$1,326.80	=	$ 804.04
CLASS III	23.1	X	$4,315.20	=	$ 996.81
					$1,800.85 in 1979 dollars (MCI = 235.1)
					$3,025.43 in Oct. 1984 dollars (MCI = 395.8)

9. Our estimates of the damage per household is based on census statistics which report three persons per household. Therefore, our low bound estimate is 3X $2,567.07 = $7,701.21 per household in October 1984 dollars. The high bound estimate is 3X $3,025.43 = $9,076.29 in October 1984 dollars. Our estimate for the 1979 flood was $1,682.84 per person in 1979 dollars which would be $8,481.51 per household in October 1984 dollars.

10. With exactly the same survey values used to generate the trauma index our estimate for the 1983 flood is $7,701.21 versus $8,481.51 per household. If the man-hours used in the cleanup statistic (trauma indicator) is shifted to the sample 1983 mean, then our estimate would increase to $9,076.29 per household. We believe that the essential statistical objective of the 1983 flood survey is to test the hypothesis, that trauma damages are a linear homogenous function of the number of households affected. We conclude that the results of the 1983 flood trauma survey support this thesis and therefore, advocate the use of $8,481.51 per household as a reasonable basis for constructing the stage damage relationship. Table 5 presents an estimate on this basis.

TABLE 5

FLOOD RECURRENCE VERSUS TRAUMA DAMAGE RELATIONSHIP*
JACKSON, MISSISSIPPI

FLOOD RECURRENCE	NO. OF HOUSEHOLDS AFFECTED	ESTIMATED TRAUMA DAMAGE ($)
2 YEAR	0	$0
5 YEAR	22	$ 186,593
10 YEAR	97	$ 822,706
20 YEAR	357	$ 3,027,899
50 YEAR	1,022	$ 8,668,103
100 YEAR	1,480	$12,552,635
200 YEAR	2,999	$25,436,048
500 YEAR	3,492	$29,617,433
SPF	3,976	$33,722,484

11. Comparing the Trauma Index variables for the 1979/1983 flood trauma surveys, Table 6 presents a summary of the statistics generated in each survey by trauma index variable. Since the total flood damage data base (other than trauma) is not organized in a way which can easily produce updated estimates for each individual property surveyed, we chose to replace the HITHARD variable (used in the 1979 flood trauma index) with another indicator. We chose an indicator of neighborliness called FEELINGS instead of HITHARD, since there is an income measure in the trauma scale and there is considerable support for use of neighborhood related scales in measuring trauma.

*Based on 1979 Survey Estimate of $1,682.82 per person in 1979 dollars, adjusted to a household basis and escalated to October 1984 per level, $8,481.51 per household.

TABLE 6

COMPARISON OF RESPONSES BY TRAUMA INDICATOR
Easter 1979 and April 1983 Floods
Jackson, Mississippi

VARIABLE NAME AND DESCRIPTION	SCORING CRITERIA	1979 Flood Survey	1983 Flood Survey
INDICATORS OF FLOOD SEVERITY TO HOUSEHOLD:			
MAN-HOURS--Man-hours required for cleanup	Over 336 hours*	53.5%	13.5%
INDICATORS OF HOUSEHOLD ABILITY TO DEAL WITH FLOOD RELATED IMPACTS:			
OLD--Age of Senior Family number	Over 62 = 1	10.0%	22.1%
INCLEV--Household Income	$ 8,000 or less = 1	18.9%	
	$12,000 or less = 1**		15.3%
INDICATORS OF TRAUMA:			
MISS WORK--Missed work because of flood	Yes	32.8%	62.5%
DISTRESS--Worry due to flood	Yes	90.9%	94.2%
ANXIOUS--Degree of anxiety due to flood	Very anxious/upset	62.7%	71.1%
DIDEVAC--Evacuated from home	Yes	94.6%	97.1%
HLTHAFT--Health after flood compared to before	Much worse	10.0%	9.6%
FEELMENT--Mental outlook after flood compared to before	Worse	29.6%	52.8%
FAMMENS--Do you worry more about family members who are not home during bad weather than before the flood?	Yes	16.6%	24.0%
PROHELP--Did you seek Professional help for emotional or physical problems due to flood?	Yes	14.9%	19.2%
LONGGONE--How long before return home?	More than 5 weeks	93.1%	69.2%

*Average (mean) for each survey
**Adjustment to account for price level increase 1979-1983

TABLE 6 (cont)

COMPARISON OF RESPONSES BY TRAUMA INDICATOR
Easter 1979 and April 1983 Floods
Jackson, Mississippi

VARIABLE NAME AND DESCRIPTION	SCORING CRITERIA	1979 Flood Survey	1983 Flood Survey
RETNORM--How long before return to normal?	Several weeks or months	97.3%	96.1%
BADWEATHER--Fear of bad weather	Lot more nervous	27.4%	47.1%
OUTLOOK--A scale based on a set of attitudes towards life after flood	Increase in negative = 1	32.6	48.0%
SHORTIMA--Short-term problems	Yes to one or more	29.2%	50.0%
LONGTERMA--Long-term problems (9 potential problems)	Yes to one or more	36.5%	69.2%
LOOTING--House looted during or following flood	Yes = 1	12.7%	10.5%
SPIRIT--Degree of neighborliness since flood	Decreased	3.1%	5.7%
FEELINGS of neighborliness	Decreased	Not used	66.3%

SUMMARY

Indices lower in 1983 flood

MAN-HOURS
Income Level
Health After
LONGGONE
Return to normal

Indices higher in 1983 flood

Age
MISS WORK
DISTRESS
ANXIOUS
DIDEVAC
FEELMENT
FAMMEMS
PROHELP
BADWEATHER
OUTLOOK
Short-term problems
Long-term problems
LOOTING

12. The respondents indicated more trauma in the majority of indicators in the 1983 than the 1979 floods. We believe that this evidence supports the thesis that these are cumulative trauma effects from repeated flooding. Earlier, we indicated that the neighborhoods are rapidly changing, due in no small part to the flood hazard. Owners or owner occupants receive the double economic effect of flood losses and declining property values--a phenomenon that carries down the ability of the neighborhoods to maintain housing quality and to generate property taxes to support urban services.

APPENDIX A

FINDINGS FROM THE 1979 "EASTER" FLOOD

IWR SPECIAL STUDY

FOR THE MOBILE DISTRICT

84-RS-2, 1984

Introduction

1. This IWR support study at the request of the Mobile District is an estimate of human costs based on the psychological effects of flooding. It was first used in a 1980 IWR study of a flood in the Tug Fork Valley of West Virginia and Kentucky, for the Huntington District. In that prototype study contractors at Cornell University, in departments of economics and sociology, were tasked to design items, develop a methodology which would provide an empirical estimate of the "human costs" due to flooding. This concept had been developed earlier as "behavioral damages", in a narrative, unquantified conceptualization in the St. Paul District for the Lower Sheyenne Valley study.

2. Floods distort and or interrupt the individual's and family's normal state and productive activities. The psychological and behavioral consequences of a flood which both hurt and impair the person can be and are, defacto, "priced" in both legal (e.g. Buffalo Creek) and technical (AMA), and administrative (VA) proceedings as dysfunctional to society in the productive sense implied by NED "theory." Therefore, they can be used as an orthodox contribution in benefit cost analysis. Damages to property and damages to people which can be avoided by flood control measures are identical in logic as measures of benefits, for there is a loss of resources to the nation in both.

3. Since the Tug Fork Planning Support Study, this basic idea of damage estimation due to the impairment of people was used a second time by Antle and Simpkins at the request of the Los Angeles District, in support of its Lake Elsinore study. In both the Tug Fork and Lake Elsinore cases the human costs were considerable in proportion to damages to residential property and contents. In both cases, the relatively low market value of residential housing limits property and contents damages.

4. The operational steps of the "human costs of flooding", methodology, are carefully shown and discussed in Section IIc of this appendix. It is based on survey reponses which indicate symptoms of human impairment. The symptoms are indexed to conform with the American Medical Association (AMA) index used to measure functional impairment of the "whole person". The indexed indicators of impairment are then matched with the the Veteran's Administration disability compensation scale for impairment. This provides a monetary estimate of the human costs of flooding.

5. A summary of the human costs of flooding at Jackson follows. It also provides a comparative basis in the Tug Fork and the Lake Elsinore cases so that the reader may assess the results for Jackson in an empirical context.

Background

6. The Jackson, Mississippi, Standard Metropolitan Area (SMA), consisting of Hinds and Ranking Counties, had a total 1980 population of 320,425. Slightly more than 80 percent of those counted were classified as urban residents. The City of Jackson itself, located almost entirely in Hinds County, had 202,895 residents, 63 percent of the SMA's total. About 60 percent of the population was white, and all but a tiny fraction of the remainder were black. There

were 107,886 households identified in 1980, with an average of 2.97 persons in each.

7. Extremely heavy rainfall occurred over the upper portion of the Pearl River Basin on the 12th and 13th of April, 1979. One headwaters gauge, at Louisville, Mississippi, recorded 9.35 inches on the 12th and another 10.25 inches on the 13th, for a two-day total of 19.6 inches. Prior rainfall in the Jackson area on 11 April had totalled 4.68 inches, thereby utilizing most of the storage in the river and in Ross Barnett Reservoir just upstream from Jackson. Two other gauges above Jackson, Edinburg and Koscinsko, recorded 10 and 13 inches, respectively, over the two-day (12-13 April) period. This storm was later estimated to form an exceeding frequency of 500 years.

8. By 15 April floodwaters had inundated large areas of Jackson, and many residents had to be evacuated from their homes. The East Jackson levee, across the river from the city, held with water nearly to the top, but the levee which protects parts of Jackson was flanked at the north, flooding the areas behind it. With the reservoir full, Ross Barnett Dam was releasing water at a rate of 125,000 cubic feet per second to keep the dam from being overtopped. Even with the regulation provided by the dam, the discharge as measured at the Jackson guage had an expected exceedance frequency of about 200 years. On 17 April the river crested at about 15 feet above floodstage.

9. There are four areas of concentrated residential development that were affected by the April 1979 flood. The northeast section of Jackson is the largest of these areas and can be divided into three major neighborhoods. In one neighborhood the homes are relatively new and range in value between $60,000 and $80,000. In the second, the homes are also relatively new and are in the $150,000 and up value range. The third neighborhood in this area is one of older homes which are being refurbished. These homes range from $40,000 to $50,000. In the downtown area, the homes are 25 to 30 years old and range in value from $10,000 to $20,000. The third and fourth concentrations of residential development are in the southern section of Jackson and directly across the river in Richland. Both areas can be characterized by moderately priced homes in the $30,000 to $50,000 range with some interspersed mobile homes and trailer parks. Damages in Hinds and Rankin Counties were $206,117,000 and $22,701,800, respectively, for a total of $228,818,800 in 1979 dollars.

The Evaluation of Human Costs of Flooding at Jackson

10. The Tug Fork report contains an extensive discussion of human costs of flooding methodology. It is based on two fundamental steps. One, a series of survey responses to a number of indicators of human impairment provide the mechanism for determining the degree of impairment. In the Jackson, Mississippi case, twenty trauma indicators are used (they are shown in Table A-I). The scores were divided into three categories of impairment. The first class (0-8) indicates a relatively minor degree of human impairment. The second class (9-12) indicates a moderate degree of impairment. The third class (13-20) indicates a severe degree of impairment. This sequence of steps is based on an American Medical Association procedure for determining human impairment[1/]. The second major step of the analysis is to relate the

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1/ See Section IIc.

degree of impairment with monetary compensation. For this analysis, the compensation schedule used by the Veterans Administration[1/] is used.

11. Each response in the post-1979 Flood Survey was scored on 20 AMA - comparable symptom indicators of traumatic experience. Table B-42 shows the definition and scoring criteria along with survey response for each trauma variable. The sum of the scores (maximum is 20) for each household's response was then computed and is shown in Table A-II. For this survey, the majority of the cases fell into the middle range of the trauma scale. As was done in the Tug Fork report, the trauma scale is divided into three classes: (1) limited trauma damage (2) moderate trauma damage and (3) severe trauma damage. Table A-III shows the results of this division of the cases.

[1/] See Section IIc

Table A-I

FLOOD TRAUMA SCALE
JACKSON, MISSISSIPPI DAMAGE SURVEY
FOLLOWING EASTER 1979 FLOOD

VARIABLE NAME AND DESCRIPTION	SCORING CRITERIA	SAMPLE %
INDICATORS OF FLOOD SEVERITY TO HOUSEHOLD:		
MANHOURS - Manhours required for cleanup	Lowest thru 336 hours = 0	46.5%
	337 hours throughout = 1	53.5%
HITHARD - Household income/ total flood damage	Damage > Annual Income = 1	73.0%
	Damage < Annual Income = 0	27.0%
INDICATORS OF HOUSEHOLD ABILITY TO DEAL WITH FLOOD RELATED IMPACTS:		
OLD - Age of Senior Family number	62 or less = 0	90.0%
	Over 62 = 0	10.0%
INCLEV - Household Income	$8000 or less = 1	18.9%
	more than $8000 = 0	81.1%
INDICATORS OF TRAUMA:		
MISS WORK - Missed worked because of flood	yes = 1	32.8%
	no answer or no = 0	67.8%
DISTRESS - Worry due to flood	yes = 1	90.9%
	no = 0	9.1%
ANXIOUS - Degree of anxiety due to flood	very anxious/upset = 1	62.7%
	somewhat or not at all = 0	37.3%
DIDEVAC - Evacuated from home	yes = 1	94.6%
	no = 0	5.4%
HLTHAFT - Health after flood compared to before	much worse = 1	10.0%
	any other response = 0	90.0%
FEELMENT - Mental Outlook after flood compared to before	worse = 1	29.6%
	same, not as good = 0	61.4%
FAMMENS - Do you worry more about family members who are not home during bad weather than before the flood?	yes = 1	16.6%
	no = 0	83.4%

Table A-I (cont)

VARIABLE NAME AND DESCRIPTION	SCORING CRITERIA	SAMPLE
PROHELP - Did you seek Professional help for emotional or physical problems due to flood?	yes = 1 no = 0	14.9% 85.1%
LONGGONE - How long before return home?	more than 5 weeks = 1 less than 5 weeks = 0	93.1% 6.9%
RETNORM - How long before return to normal?	Several wks or months = 1 Shorter time = 0	97.3% 2.7%
BADWEATHER - Fear of Bad Weather	Lot more nervous = 1 Other = 0	27.4% 72.6%
OUTLOOK - A scale based on a set of attitudes toward life after flood.	increase in negative = 1 other = 0	32.6% 67.4%
SHORTIMA - Short term problems (9 potential problems)	yes to one or more = 1 no = 0	29.2% 70.8%
LONGTERMA - Long term problems (9 potential problems)	yes to one or more = 1 no = 0	36.5% 63.5%
LOOTING - House looted during or following flood	yes = 1 no = 0	12.7% 87.3%
SPIRIT - Degree of neighborliness since flood	decreased = 1 increased = 0	3.1% 96.9%

TABLE A-II

TRAUMA INDEX RESULTS
JACKSON, MISSISSIPPI
DAMAGE SURVEY FOLLOWING EASTER 1979 FLOOD

Trauma Score	No. of Cases	% of Total	Cumulative %
3	1	.2	.2
4	1	.2	.4
5	3	.6	1.0
6	8	1.5	2.5
7	23	4.4	6.9
8	46	8.9	15.8
9	91	17.6	33.4
10	103	19.9	53.3
11	70	13.5	66.8
12	74	14.3	81.1
13	40	7.7	88.8
14	33	6.4	95.2
15	14	2.7	97.9
16	1	.2	98.1
17	4	.8	98.8
18	1	1.2	99.0
19	2	.4	99.4
20	3	.6	100.0
TOTAL:	518	100.0	

TABLE A-III

TRAUMA SCORE CLASSIFICATION
JACKSON, MISSISSIPPI
DAMAGE SURVEY FOLLOWING EASTER 1979 FLOOD

Trauma Score	No. of Cases	Frequency (percent)
1-8 (Class I)	82	15.8
9-12 (Class II)	338	65.3
13-20 (Class III)	98	18.9

12. Since two other human impairment flood damage studies have been conducted it is enlightening to compare the three situations. Each of the communities have significantly different flooding conditions (velocity, depth, duration, debris transport, etc.), as well as differing land use, and socio-economic, and historic characteristics of flood plain occupants. The results at Jackson, correspond with inferred expectations based on these attributes. At Jackson, a significantly higher percentage of the trauma scores are in the middle range, and fewer are in the severe trauma effects class than was true after the violent act of nature in the Tug Fork Valley. Table A-IV presents the comparison of the percentage of individuals in each trauma effects class in the three studies.

TABLE A-IV

COMPARISON OF PERCENTAGE OF INDIVIDUALS IN EACH
TRAUMA EFFECT CLASS
TUG FORK, LAKE ELSINORE, AND JACKSON

	I	II	III
TUG FORK, WEST VIRGINIA AND KENTUCKY	30.0%	41.0%	29.0%
LAKE ELSINORE, CALIFORNIA	24.6%	56.4%	19.0%
JACKSON, MISSISSIPPI	15.8%	65.3%	18.9%

13. The trauma score classes (representing severity of human resource damage) are related to "impairment of the whole person" monetary compensation given by the Veterans Administration for psychological trauma-related impairment of Veterans. The monetary damage estimate for each class is based on the values developed in the Tug Fork report, adjusted to 1983 price level by the Consumer Price Index (CPI). The following Table A-V shows the monetary value of the flood related trauma damage categories and the single-event total for the Easter 1979 flood in Jackson, Mississippi.

TABLE A-V

TRAUMA DAMAGE PER PERSON
JACKSON, MISSISSIPPI
EASTER 1979 FLOOD

CLASS	PERCENT IN CLASS		DAMAGE FOR CLASS		WEIGHED DAMAGE PER PERSON
CLASS I	15.8%	x	$0	=	$ 0
CLASS II	65.3%	x	$1326.60	=	$ 888.27
CLASS III	18.9%	x	$4315.20	=	$ 815.57

$1,682.84 in 1979 Dollars
(CPI = 181.5)

$2,488.00 in 1983 Dollars
(CPI = 268.4)

Damage Per Household Flooded = 3 (average number of persons per household) x $2488 (damage per person) = $7,464 (per household) for the 1979 event. Since 1,976 households were flooded in the 1979 flood, rather than just the 518 in our survey sample, the total estimated trauma damage for that event is 1,976 (Households) x $7,464 (per household)=$14.8 million in 1983 dollars for the "EASTER" flood event.

Construction of Stage Damage Relationship

14. The flood trauma damage estimated above is for just one flood event. Since there are no surveys of flood trauma damage of any community for more than one flood event, there is no firm empirical evidence of the relationship of flood trauma magnitude to greater or smaller flood (water) events. Therefore, at this time, construction of the trauma stage-damage relationship by basing it on the number of households affected (hence persons) appears to be a logical and reasonable assumption. Both the empirical evidence we have from three unrelated floods and the body of social psychological suggest it as well. Table A-VI shows the effects of that assumption.

TABLE A-VI

FLOOD RECURRENCE VERSUS TRAUMA DAMAGE RELATIONSHIP
JACKSON, MISSISSIPPI

Flood Recurrence	No. of Households Affected	Estimated Trauma Damage ($)
2 YEAR	0	0
5 YEAR	24	179,136
10 YEAR	119	888,216
20 YEAR	387	2,888,568
25 YEAR	522	3,896,208
33.3 YEAR	798	5,956,272
50 YEAR	1,064	7,941,696
100 YEAR	1,505	11,233,320
200 YEAR	3,033	22,638,312
500 YEAR	3,523	26,295,672

APPENDIX B

EXCERPTS FROM

AN IMPACT ASSESSMENT OF THE 1979 EASTER FLOOD ON RESIDENTIAL, COMMERCIAL AND INDUSTRIAL STRUCTURES

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Data Acquisition Methodology

1. The data needs for this research consist of both secondary and primary data. Secondary data consists of financial reports from the governments of the state of Mississippi, the city of Jackson, Mississippi, public and private owned utilities, churches and other agencies which provided assistance during and after the flood. Primary data are those data obtained from homeowners/ dwellers of residential units, owners/managers of commercial firms and industrial organizations. The techniques for collecting the data are described separately under the headings of secondary data and primary data.

2. The next section describes the sampling procedures employed in the collection of data from the residential units selected for study. Before turning to the specifics of the samples, a general discussion of multistage stratified cluster quota sampling should clarify some of the inherent problems and complexities of such a design.

Multistage Stratified Cluster Quota Sampling

3. Multistage stratified cluster quota sampling is a combination of several techniques associated with probability sampling. As Babbie (1973) notes, multistage cluster sampling is based on repeated listing and sampling by the researcher. The multistage process involves sample selection from different, but related, levels or stages. By using clusters, the researcher is able to select sample units from the target population in groups rather than individually. "Such a design typically involves the initial sampling of groups of elements-clusters followed by the selection of elements within each of the selected clusters," (Babbie, 1973:96). By stratifying the sample, a more representative sample may be achieved, thus decreasing the probable amount of sampling error. Stratification can be employed by arranging the elements of the population into strata or subsets. These subsets are homogenous within, while at the same time heterogeneity exits between them. From these subsets, the researcher draws an appropriate number of elements. Finally, quota sampling is a process of selecting units on a proportionate basis (Kish, 1965).

4. In order to use this type of sample design, it is necessary to first partition the population into clusters according to specified criteria and then stratify these clusters by city block or some other appropriate characteristic. Once the clusters have been identified, the sampling frame can be developed, and simple random sampling procedures may be applied to select the elements from the sample list.

5. There are certain advantages and disadvantages associated with using a multistage stratified cluster quota sampling design. Kish (1965) suggests that the advantages of such a design are: 1) it is more convenient and less costly than a simple random sample; 2) the clustering of units reduces the numbers of units on the sample list; 3) it allows for the stratification of units which permits selection from each strata; and 4) it allows simple random selection procedures to be applied to select sample units from within strata.

6. There are several potential problem areas which may be encountered when a multistaged stratified cluster quota sample design is employed to select the units for study: 1) sample means and variances are biased estimates of the population mean and variance; 2) tests of statistical significance based on these estimates are misleading; and 3) a greater probability of increased sampling error exists.

7. Corrective measures for the first two problems have been suggested by Kish (1965). Specifically, he has shown that by using the ratio means and variance to estimate the population parameters minimized both concerns. In regard to the problem of sampling error, it is noted that the potential for such errors exists at each stage of the design. In addition, when sample elements are drawn from clusters, particularly homogeneous clusters, estimates of sampling error may be overly optimistic.

8. One of the ways in which sampling error may be reduced is in the absolute size of the samples. The magnitude of the sampling error in simple random sampling is correlated with the size of the samples. Generally, as the size of the samples increases, the magnitude of the sampling error decreases. Since it is expected that some degree of sampling error will be represented at each stage of the sampling process, a sufficiently large number of sample units should reduce the size of the sampling error. Further, the utilization of simple random selection techniques at one or more stages of the multistage design should enhance the reduction in sampling error.

9. Finally, a necessary aspect of any interpretation of statistical data is precaution. Accordingly, the analyses of the data will feature a conservative approach in the application of statistics to the data.

10. The following section describes in detail the sampling procedures to be employed in the selection of the samples of residential units, commercial firms and industrial organizations from the urban areas of Jackson, Mississippi subjected to damage by the Easter Flood.

Sampling Selecting Procedures

11. As noted above the sample design for selecting the units of study for Easter Flood is complex. Specifically, the design must provide a method by which samples from residential units, commercial firms and business organizations can be selected, while at the same time be representative of the geographically distinct areas within the city of Jackson, Mississippi. Accordingly, the most appropriate design to achieve these goals in a multistage stratified cluster quota sample in which the essential stratification is on the units to be studied (i.e., residential, commercial and industrial).

12. Given that the population is stratified by type of structure (i.e., residential, commercial and industrial), one sample was selected for residential units, and another one was selected for the commercial units. In Table B-I., the population for each type of unit, sampling fraction and quota size for those units selected for interview are shown.

TABLE B-I

NUMBER OF SAMPLE UNITS IN POPULATION, SAMPLING FRACTION AND QUOTA SIZE

Population Elements	Number	Sampling Fraction	Quota Size
Residential	2,050	.253	518
Commercial	500	.50	254
Industrial	37	1.0	37
Total:			800

13. Having determined the size of the samples, and the specification of quotas for each type of structure, attention is now directed toward the issue of clusters and representativeness of samples.

Stage One: Delineation of Cluster Areas

14. One of the concerns noted above is that the sample selection process must provide samples that are representative of the geographical, racial and socio-economic areas of Jackson. To insure that the units selected for study are representative of these areas maps of the city of Jackson will be subdivided into clusters. The criteria to establish the boundaries for these areas are based on the ecological organization of the city. Assuming that urban ecological units are both geographically limited and socioculturally homogeneous, such units will be easily identified on maps of the urban area.

15. In identifying the areas of the city, attention was given to the use of natural areas and/or sectors as a method for delineating the ecological patterns of Jackson. Natural areas are usually definable by such physical features as hills, rivers, railroad tracks, streets and highways, and/or distinctive names that serve to delineate a community within a community. Generally, natural areas have a high degree of cultural and economic uniformity.

16. The urban area of Jackson was subdivided as follows: Upper Northeast Jackson, West of Pearl River to the west boundary of the 1979 Easter Flood and north of Hanging Moss Creek: Lower Northeast Jackson, west of the Pearl river to the west boundary of the 1979 Easter Flood and north of Lakeland Drive; Fairground area, west of the Pearl River, south of Lakeland Drive, north of I-20 and west to the limits of the 1979 Easter Flood; Southwest Jackson, South Jackson, Byram and Flowood-Pearl and Richland, all east of the Pearl River.

17. It should be noted that the subdivision of an urban area by the methods described above is not without problems and disadvantages. For example, natural areas tend to be large and difficult to clearly delimit within cities. Sectors are useful for delineating residential area but are problematical for identifying industrial zones. Census tracts present problems in that they are usually too numerous and are arbitrarily delineated.

18. In order to avoid the problems noted above, the research staff visually survey each cluster area to locate commercial and industrial units in each cluster. The identified commercial and industrial firms were checked on address range maps as to their location.

19. Once the cluster areas were delineated, infra-red aerial photographs of Jackson, which were taken about 30 minutes before the peak of the flood from an altitude of 12,000 feet, were used to identify the limits of the flood water in the urban area of Jackson. The infra-red photographs provided a method to ascertain the extent of flooding within each cluster area, and to identify those structures inundated.

20. Cluster areas which received flooding were identified on address range maps of Jackson, and the number of residential units was determined for each cluster. A second visual inspection of these areas assisted the researchers in determining the appropriateness of the areas for identifying the structural units (residential, commercial and industrial) subjected to flooding.

21. After identifying the flooded areas by streets and address of the flooded residential units a sampling frame was constructed listing the 2,050 residential units by address. A 25 percent systematic random procedure yielded a sample of 518 residential units for study.

22. Similarly, the commercial firms were selected on a systematic random basis. The firms were identified according to their geographical location within the flood plain. Staff personnel were instructed to visually review the cluster areas, make field notes of the commercial organizations, and then, systematically select those firms that were representative of the clustered commercial organizations. Approximately 1,000 commercial organizations were identified of this number, 227 (22.7 percent) were selected for interview.

23. The industrial units were identified through several procedures: 1) information relative to the number of industries in the Jackson area was obtained by the Mississippi Research and Development Center, and from the Jackson, Mississippi Chamber of Commerce. The list provided by these two agencies permitted the identification of the industries on address range maps relative to the 1979 flood. In the basis of these techniques, 37 industries which were inundated were identified. Officers of the industrial units were contacted via telephone and an interview date was arranged. Completed interviews represent 100 percent of the flooded industries.

Social, Psychological, and Physical Health Consequences

24. This section of the report focuses on social, psychological, and physical health consequences of the 1979 Easter Flood for the sample. While the most

evident consequences of a natural disaster are typically related to economic upheaval and physical destruction, victims may also suffer less evident social and psychological problems as well.

25. Social consequences include displacement of residents from their homes for a day or longer, the occurrence of looting, and other self-reported life-style disruptions. Psychological consequences are of a wide variety: insomnia, nervousness, anxiety, depression, general mental confusion, loss of appetite, and so forth.

Social Consequences

26. Natural disasters frequently cause disruptions in daily lifestyle. Of the sample responding, 98.6 percent (n=497) evacuated their homes. Of these persons, 89 percent were out of their residence for several weeks or more (n-429). Only 1.7 percent (n-8) evacuated for a day or less. Finally, 9.3 percent (n=45) were absent for about a week.

27. While natural disasters victimize some residents, they also provide a chance for others to illegally obtain possessions through looting. Thirteen percent of those responding underwent some looting to their premises. Fifteen households suffered losses in excess of 1,000 dollars.

28. In an effort to broadly measure the short and long-term effects of the 1979 Easter Flood, respondents were asked: "Has the flood had an effect on your way of life, either short or long-term? Sixty percent answered, "Yes". The single largest response category was financial costs. Other answers include disruption of routine, nervousness, anxiety/worry, and a realization of the need for better preparation. While the financial consequences of the flood were most severe, clearly the victims felt pressures in non-economic ways as well.

Psychological Consequences

29. Following a large-scale natural disaster, psychological stress reactions may take many forms. These include insomnia, nightmares, anxiety, trembling and fear. For the present sample, post-flood psychological stress is measured by six fixed-choice questions:

Do you think or daydream about the flood?

Do you listen more closely for weather advisories now that before the flood?

Do you feel more anxious, nervous or upset when it looks like bad weather than before the flood?

Do you worry more now about flooding, specifically when it rains hard?

Do you get any kind of physical reaction when it rains hard or bad weather threatens that you didn't get before the flood?

30. Table B-IIpresents a summary of positive responses to each item. The most frequently reported response is listening more closely to weather advisories since the flood (87.5 percent). Seventy-two percent report feeling more anxious, nervous, or upset when it looks like bad weather. Also, 80.5 percent worry more about flooding when it rains hard. While comparatively few have physical reactions when it rains hard or threatens bad weather (30 percent), over 45 percent think, daydream, or have nightmares about the flood.

TABLE B-II

NUMBER AND PERCENTAGE OF RESPONDENTS ANSWERING YES TO SPECIFIC PSYCHOLOGICAL STRESS ITEMS

PSYCHOLOGICAL STRESS ITEM	(NO.)	(Percent)
1. Do you think or daydream or have night dreams about the flood?	230	45.5[1/]
2. Do you listen more closely for weather advisories now than before the flood?	452	87.5[2/]
3. Do you feel more anxious, nervous, or upset when it looks like bad weather than before the flood?	373	72.0[3/]
4. Do you worry more now about family members who aren't home during bad weather than before the flood?	150	30.0[4/]
5. Do you worry more now about flooding, specifically when it rains hard?	416	80.5[5/]
6. Do you get any kind of physical reaction when it rains hard or bad weather threatens that you didn't get before the flood?	157	30.5[6/]

[1/] Based on N=17 [2/] Based on N=517 [3/] Based on N=518 [4/] Based on N=500
[5/] Based on N=517 [6/] Based on N=515

31. These figures indicate that Jackson victims of the 1979 Easter Flood continued to suffer a considerable amount of psychological stress at the time of the interview. The responses to these six items can be scaled in such a manner as to divide the sample into high, medium, and low stress subgroups. If respondents had not experienced the described situation, they were given a score of 0 for that item. If the described situation was experienced immediately following the flood but not at the time of the interview, a value of 1 was assigned. If the respondent indicated that he sometimes experienced the item, a score of 2 was given. If the respondent still experienced the item at the time of the interview, a value of 3 was scored.

32. Total psychological stress scores may be obtained by adding the 6 items for each respondent. the range of scores for the scale is 0 (the lowest amount of stress) to 18 (the highest amount). Table B-III is a grouping of scores into low stress (0 to 5), medium stress (6 to 11), and high stress (12 to 18) categories.

TABLE B-III

NUMBER AND PERCENTAGE DISTRIBUTION
OF PSYCHOLOGICAL STRESS SCORES

LEVELS OF STRESS	NO.	PERCENT
Low Stress	25	4.8
Medium Stress	340	65.6
High Stress	153	29.5
Total	518	99.9*

*Percentages do not add up to 100 due to rounding error.

33. As can be seen, only 4.8 percent of the sample are in the low stress category. Almost two-thirds (65.6 percent) fall in the intermediate group. Finally, 29.5 percent of respondents scored high on the scale. Psychological stress, as measured by the six items described, is widely evident in the present sample.

34. As a general indicator of emotional/mental health, the respondents were asked how they felt emotionally or mentally since the flood as compared to before. Table B-IV summarized the responses. A total of 200 respondents (38.8 percent) report feeling "not as good" or "much worse". The majority (57.9 percent) report no general change in their mental outlook.

TABLE B-IV

MENTAL/EMOTIONAL OUTLOOK OF
RESPONDENTS SINCE THE FLOOD
AS COMPARED TO BEFORE

OUTLOOK	NO.	PERCENT
Much Better	17	3.3
About the same	299	57.9
Not as good	146	28.3
Much worse	54	10.5
Total	516	100.00
No Response	2	
Grand Total	518	

35. In summary, psychological reactions to the 1979 Easter Flood are fairly widespread, even more than a year after the event. Respondents apparently suffer higher levels of stress when bad weather threatens or during hard rains than at any other time.

Physical Health Consequences

36. While flood-related psychological stress is evident in the sample, few of the victims actually sought help for physical or emotional problems. Seventy-seven respondents (15.8 percent) sought professional aid for such problems, perceived on their part to be flood-related. Sources of aid mentioned include seeing a doctor (n=40), hospitalization (n=19), and medication (n=17). Symptoms leading to the seeking of aid include nervousness (n=17), heart and blood pressure problems (n=19), anxiety (n=7), among others.

37. Similar to the indicator of general psychological well-being, the respondents were asked about the status of their physical health since the flood. One hundred and sixty respondents (31 percent) answered "much worse" or "a little worse". The majority (65.1 percent; n=336) considered their health to be about the same as before the flood (Table B-V).

TABLE B-V

STATUS OF RESPONDENT'S PHYSICAL HEALTH SINCE THE FLOOD AS COMPARED TO BEFORE

PHYSICAL HEALTH	NO.	PERCENT
Much worse	52	10.1
A little worse	108	20.9
About the same	336	65.1
A little better	17	3.3
Much better	3	.6
Total	516	100.0
No response	2	
Grand Total	518	

38. This section has demonstrated widespread social displacement following the 1979 Easter Flood, rather infrequent looting, and the presence of at least mild if not severe psychological stress reactions in the victims. While physical damage estimates receive most of the attention following natural disasters, victims often suffer more latent consequences as well.

APPENDIX C

EXCERPTS FROM

HUMAN COSTS ASSESSMENT: THE IMPACTS OF

FLOODING IN THE TUG FORK VALLEY

IWR SPECIAL STUDY FOR THE HUNTINGTON DISTRICT

APRIL 1980

Constructing the Flood Trauma Scale

1. The first step in quantifying flood effects involves grouping responses to various questions to get an overall picture of the flood impact on each household interviewed. In doing this, the trauma scale, as described previously, was derived. To obtain this scale, several factors identified as potentially contributing to the overall trauma experienced by flood victims were examined for each household surveyed. Each contributing factor was given a rating of 0 or 1 to indicate an experience which was not likely to contribute to the overall trauma of the flood experience or an experience which would add to the severity of the situation, respectively. Twenty-two factors were examined for each household (see Table C-I.). A twenty-third factor was also looked at which gave respondents the opportunity to speak of the positive effects, if any, that the flood may have had on their lives. This factor was rated -1 and had the effect of reducing the respondent's trauma level if the response indicated that the household did benefit in some way from the flood. For example, some comments were that the flood helped bring neighbors closer together because of the concern displayed over one another's safety and the generosity toward those who had been left homeless.

2. Tabulation of these factors involved grouping responses to sets of questions to establish a rating on severity of flood impact. The ratings are designated to designate those factors which did contribute to the trauma of the event for each household. Thus, a yes (rating = 1) indicates the respondent experienced the trauma-contributing event. A no (rating = 0) indicates the respondent experienced minimal or no negative effects from the contributing factor being considered. Thesle ratings were then aggregated for each household by summing them. This gave each household an overall rating, placing each at a specific point on the continuum of the scale. The scale ranged from a low of -1 to a high of 20.

3. The highest trauma rating possible under this rating procedure was a 22. However, the highest rating on the households surveyed was a 20. The median level of trauma was 10.6 and the distribution is skewed slightly toward the left. A third of the households, 33 percent, were positioned between the 10th and 12th steps of the scale which is the middle range of the total possible trauma points.

4. A scale by number of households and with number of persons per household was constructed. This scale showed that households with higher ratings tended to have more persons in the household, as would be expected.

5. Due to the ordinal nature of the scale which has been constructed here, many statistical tests have little validity. That is, an ordinal scale defines the relative position of individuals with respect to, in this case, flood trauma, but distances between points on the scale have little meaning. It is merely a ranking procedure.

Table C-I

CODING OF TRAUMA CONTRIBUTING FACTORS

Trauma contributing factors

	Coded
General health	
1. Has health changed as result of flood?	
- worsened	1
- same, better	0
Physical injury	
2. Was anyone injured or made ill during flood?	
- yes	1
- no	0
3. What was the nature of the injuries?	
- high blood pressure, heart problems, psychological distresses	1
- colds, sprains and strains, broken bones, backache	0
Mental stress	
4. Did you receive any warning of the flood?	
- no warning	1
- warning	0
5. Did the warning give you time to protect yourself?	
- warning not sufficient	1
- sufficient warning	0
6. Have you had any previous flood experiences?	
- no	1
- yes	0
7. Do you know of anyone who died as a result of the flood?	
- yes	1
- no	0
8. Did you experience any change in relationship with friends and/or neighbors as a result of the flood?	
- yes, worsened	1
- no change; better	0
9. Did you experience any change in relationships among family members as a result of the flood?	
- yes, worsened relationship	1
- no change; better	0

10. How badly was your home damaged by the flood?
    - some damage to completely ruined 1
    - no damage 0

11. Did you lose anything of sentimental value in the flood?
    - yes 1
    - no 0

12. How would you describe your family's state of mind since the flood?
    - worsened in some way 1
    - same as before the flood 0

13. How has your state of mind changed as a result of the flood?
    - worsened 1
    - same as before the flood 0

14. In what other ways has the flood experience upset you?
    - other concerns related to the flood 1
    - none 0

Hassle factors

15. Were you forced to leave your home during the flood?
    - yes 1
    - no 0

16. What things did you have to do without during the flood?
    - clothing; water; utilities; food; sleeping quarters; all of above 1
    - nothing 0

17. How long was it before you could return to your home?
    - more than 1 day 1
    - 1 day or less 0
    - if never returned to their home because of extensive damage 1

18. What things did you have to do to your home to make it livable again?
    - new furnishings, rewiring, plumbing, new furnace, cleaning 1
    - none or very little 0

19. What problems, if any, did you encounter during cleanup?
    - financial, physical, mental, other 1
    - no problems 0

20. Did anyone in family miss work because of the flood?
    - yes 1
    - no 0

Extended effects

21. Have things returned to normal in your household since the flood?
- no; somewhat 1
- yes; unsure 0

22. Do you feel that by experiencing the flood, you have met a great challenge?
- yes 1
- no, unsure 0

Establishing Levels of Human Impairment

6. To provide for evaluation of human benefits the trauma scale must be further defined. It should correspond to what American Medical Association (AMA) terms "percent impairment of the whole man." A rating or percent of impairment is determined by an evaluating physician. It is an "appraisal of the nature and extent of the patient's illness or injury as it affects his personal efficiency in one or more of the activities of daily living." (AMA, 1977)

7. The majority of contributing factors identified as potentially influencing the degree of trauma were psychological rather than physiological. Therefore, the AMA criteria for evaluating permanent impairment due to psychoneuroses was chosen to define the trauma scale ratings. Trauma scale levels derived from the household survey were then correlated with ranges of percent impairment described by the AMA.

8. The AMA classifies loss of function due to psychoneuroses are described in specific medical terms. These reflect six "psychoneurotic reactions"--anxiety, depressive, phobic, psychophysiologic, obsessive-compulsive, and conversion. Ratings determined by the AMA include not only the illness itself, but social and economic consequences as well. The intent is to evaluate the impairment in terms of loss of physiological, psychological, personal, or social adjustment due to flood trauma.

9. The three classes of impairment are summarized below, listing those AMA descriptive statements which apply most directly to responses received on the household survey.

Class I--Impairment of whole man = 0 to 5 percent:

- Mild anxiety episodes are predominantly in response to stress situations, requiring little or no treatment, and seldom associated with clear-cut subjective suffering.

- Usual activities of daily living can be accomplished but are associated on occasion with lack of ambition, energy, and enthusiasm for the current situation.

- Self-limiting reactions to passing stress, e.g., gastrointestinal upsets.

Class 2--Impairment of whole man = 10 to 45 percent:

- Moderately severe anxiety and apprehension.

- Depressive reactions leading to disturbances of sleep cycle and eating habits, loss of interest in customary personal and social activities.

- Fear-motivated behavior which interferes in a mild to moderate way with the activities of daily living.

- Episodes of loss of physiological function.

Class 3--Impairment of the whole man = 50 to 95 percent:

- Severe states of foreboding, tension, and apprehension.

- Depressive reactions display a marked loss of interest in the usual activities of daily living, such as eating or self-care.

- Severe phobic patterns of adjustment occur that behavior becomes bizarre and disruptive.

- Loss of physiological function occurs frequently.

Relating the Flood Trauma Scale to Human Impairment

10. Examining each step of the scale individually, in terms of trauma factors present at each step, gives some indications that there may be an ordering of the factors which come into play as the scale progresses from -1 to 20. That is, those factors which are common to those households at the lower end of the scale are characterized by: not having received any warning; having to leave their homes during the flood; having to perform some repairs on their homes; and believing that they had met a great challenge through the flood experience. (There were things such as clothing and heat that they had to do without during the flood.) This lower range extends from -1 to 3 on the trauma scale.

11. At a rating of 4 through 8, other factors come into play, such as: a general worsening in health; a rating of the damages to their homes; loss of possessions of sentimental value; indications that the flood had some negative effects on the overall mental well-being of family members and upon respondents' mental state; indications that these households had been displaced from their homes for periods longer than one day; and had household members who had missed work due to the flood.

12. The range 9 to 12 on the trauma scale brought in the highest concentrations of factors, with the addition of such factors as: illnesses caused by

the flood; deaths attributed to the flood; changes in relationships with friends and neighbors; additional evidence that the mental well-being of the household head as well as family members has been in some way affected; financial, physical and psychological problems which arose during cleanup; households permanently displaced due to severe damages, and a feeling within households that their lives had not yet returned to normal since the flood.

13. The next step on the scale brings in the remaining factors and shows a concentration of these between the scale points of 13 to 16. As well as the above-mentioned factors, households in this range show: illnesses and injuries of the household head which fell into the categories of heart problems, high blood pressure and pyschological distresses; and changes in family relationships that were attributed to the flood.

14. The last grouping on the scale, covering points 17 to 20, shows a scattering of households across almost all factors. Summarizing this breakdown, it shows a five step scale as follows:

-1 to 3 temporary displacement, home repairs, lack of basic living necessities, feeling they had met a great challenge.

4 to 8 above factors plus general worsening of health, reported structure damages, loss of sentimental possessions, negative impacts on mental well-being of family, missed work.

9 to 12 above factors plus flood related illness, changes in relationship with neighbors, additional negative effects on mental well-being of the family, problems during cleanup, permanent displacement, lack of feeling of normalcy within the households.

13 to 16 above factors plus serious flood-related illnesses and injuries, changes in relationships with the family.

17 to 20 almost all factors reported.

15. Preliminary attempts to scale the contributing factors through the Guttman scaling technique did not support our tentative hypothesis that the scale was cumulative. That is, that as the level of trauma increases, it follows the same pattern for each respondent (e.g., two households with a trauma rating of 10 will have experienced the same flood effects in order to have been placed at the same point on the trauma scale). The coefficient of reproducibility was .81, with 56 percent improvement. (A coefficient of reproducibility greater than .9 would indicate a valid scale.) Further manipulation of the variables, i.e., withdrawing some variables from the scale and/or regrouping the variables, may improve the results of the Guttman scale.

16. If further attempts were to prove successful, the resulting set of contributing factors could be used as predictors for a single household's response pattern. That is, if reliable data for scalable contributing factors were obtained, the resulting index would be an accurate picture of the trauma level experienced by each household in relation to every other household on the index.

17. The five-part breakdown of the trauma scale was done by analyzing the responses identified as contributing to the overall flood trauma. Further aggregation of the trauma factors reduces the scale to a three-level breakdown. Looking at the AMA classes of impairment, descriptions for rating impairment are given for three levels. So, to accurately group respondents into an impairment rating, the scale steps will be reduced to a three-part scale matching respondents' descriptions with impairment rating categories.

18. First an even breakdown of the index into thirds by percentile is examined. This results in:

Level I = 1 to 9 points (39 percent of households)

Level II = 10 to 12 points (32 percent of households)

Level III = 13 to 20 points[2/] (29 percent of households)

19. Another approach would be to include those households within plus or minus one standard deviation about the mean. This results in:

Level I = 1 to 6 points (19 percent of households)

Level II = 7 to 13 points (61 percent of households)

Level III = 14 to 20 points (20 percent of households)

With this procedure approximately two-thirds of the sample falls within the middle category.

20. Referring again to the step-by-step picture of households at each point on the trauma scale, we see that factors which appeared in the upper position of the scale are most heavily clustered within the 13 to 16 point range. For example, of the household heads reporting serious illnesses caused by the flood, almost 70 percent fall within the 13 to 16 point range on the trauma scale. Likewise, for those reporting changes in relationships among family members, 74 percent fell within this same range. Additionally, nearly 60 percent of the households reported illness among family members. Almost 50 percent of those households felt their lives had not gotten back to normal since the flood. Forty-seven percent of households who reported that their family's mental well-being had suffered and 41 percent who felt their state of mind had been adversely affected also are within the 13 to 16 point range. Compared with the percentage of the total sample within the range, 27 percent, this suggests that given the apparent ordering of the trauma contributing factors, the households in the range from 13 to 16 points and higher reflect those which experienced the greatest impact from the flood. Thus, this group of households should be placed in the Level III category which the AMA has defined for rating impairment.

[2/] A point between two steps on the scale has little meaning so allowances are made in the percentile breakdowns so that cutting points fall on the whole number.

21. Looking at the lower end of the trauma scale and at the AMA ratings for impairment suggests that those households which fall from -1 to 8 on the trauma scale may be placed in the Level I rating for impairment. This group would be indicative of those households which were least affected by the flood. That is, this group experienced what we have termed hassle factors as well as some factors which may have contributed to the mental stress of the flood experience. However, most of those factors identified as mental stress factors, physical injury and general health status, as well as extended adverse affects, are not present in this group of households. Thus, in comparison with groups of households at other levels on the scale, this group would be most fairly categorized as the least affected group.

22. This brings the final breakdown of the trauma scale to be:

Level I = -1 to 8 points (representing 30 percent of sample households)

Level II = 9 to 12 points (representing 41 percent of sample households)

Level III = 13 to 20 points (representing 29 percent of sample households)

Adjusting the Trauma Scale for Frequency and Magnitude of Flooding

23. Little information is available on the duration of the psychic impairment caused by flood experiences. But the history of flooding in this area of Appalachia suggests that the frequency and magnitude with which floods occur may be the key factors to examine. Flood zone locations were available for 156 of the households surveyed. The three households which fell at 17 or above on the trauma scale were located below the 5-year flood frequency line at the time of the flood. The one household positioned at -1 on the trauma scale was located in the SPF frequency zone at the time of the flood. Using the 156 households as a subsample for which flood frequency data is available, we positioned the remaining households on the upper level of the trauma scale (representing one-sixth of the total households surveyed). Thirty-two percent of the households were within the 5-year flood line and another 32 percent were within the 20-year flood line. This suggests that those suffering the greatest trauma as it has been defined here were indeed those located in the high frequency flood zones and those who are also most likely to be victims of subsequent floods within their lifetimes. In addition, another 32 percent of those households on the highest level of the trauma scale were located between the 20- and 100-year flood lines. From this it may be inferred that the compensation allocated to those individuals on Level III of the trauma scale will vary little for floods of 100-year magnitude or less. This may be so for those on the middle level of the trauma scale as 81 percent of subsample households rated Level II on the trauma scale are also located below the 100-year frequency line.

24. Information on the depth of flood waters was obtained for a group of 122 households. The five-part breakdown of the trauma scale described earlier in this section is used as it displays the most accurate descriptive breakdown of individual households.

25. Regression analysis showed no significant correlation between position on the trauma scale and depth of flood waters in the housing structure. However, the data do display some tendency toward increased trauma with increasing flood depths. This tendency can be seen by examining the percentage of households at each level on the trauma scale, moving down a single flood-depth group. For example, the percentage of households with less than 3 feet of flood waters surrounding their homes ranged from 33 percent on the low end of the trauma scale to 0 percent on the high end. Similarly, if we examine peak concentrations of households for each trauma level, the depth of waters for the highest percentage of households increases from low trauma rating to high. This simple analysis is useful in that it suggests that a relationship between flood trauma and depth does exist. However, the data do not statistically support the relationship.

26. Other variables were also examined as potential trauma indicators. These are factors readily identified for a flood plain population which could be used as predictors of the trauma level likely to be experienced by each household in the event of a flood. These variables included: years of schooling completed by household heads, sex, and age of household head, income, type of family units (i.e., single individual; husband-wife, no children; husband-wife with children; extended family group, etc.), as well as flood frequency zone location and depth of flood waters.

27. Thus far, none of these variables have proven statistically valid indicators of potential flood trauma. Therefore, at this point trauma predictions for other flood events would be unprecedented. Reviewing the procedures used to develop the trauma scale and identify potential trauma indicators suggests that additional research of this type on other flood events is needed.

28. Can we conclusively say whether "trauma indicators" can be related to such factors? To apply the methodology used in this research to other flood events, some modifications in the approach need to be examined. The evaluation instrument is an extremely important link in the procedure for developing the trauma scale. Knowing the sorts of responses that may be expected from various types of questions suggests that revision of the questionnaire would help to refine the results of the scaling procedures. Additionally, the accuracy of the data used as household trauma indicators, such as depth and income, is very important so that statistical analysis will be more conclusive.

29. Further research on other floods would not only be useful for clarifying and concluding the results presented here. It would also be useful in analyzing the degree of impact of a flood on its victims by comparing characteristics of the flood itself, as well as those of the flood plain and its population.

Valuation of Flood Trauma for the 1977 Flood in the Tug Fork Valley

30. Three approaches to estimating the social willingness to pay or be paid for flood trauma are presented. The first follows the approach discussed in the previous section, applying the three step version of the flood trauma scale which was felt to reflect the impairment levels of the American Medical Association. In turn, these are related to the compensation rates used by the Veteran's Administration.

31. Two alternative approaches have intrinsic merit and provide a measure of confirmation. The first utilizes the procedures followed in the allocation of the funds among the litigants in the Buffalo Creek suit. The method of estimating differences in trauma is of interest in this case. The second utilizes a widely cited scale that measures different degrees of social readjustment due to various life events. These are then valued by applying average Worker's Compensation rates.

Valuation of Flood Trauma Scale by VA Compensation Rates

32. The Veteran's Administration has no currently recorded precedence for granting compensation for what is referred to as war trauma. In addition, psychological disturbances are described in VA ratings only as they pertain to "industrial adaptability," i.e., earning capacity. (VA Proposed Revision of Schedule for Rating Disabilities, 1973) Ratings involving psychiatric disabilities are described in terms of time lost from work and the decrease in work efficiency. "Social inadaptability"--poor relations with others--is recognized as an indication of emotional illness. But it cannot be used as the sole basis for any specific percentage evaluation. Thus, there will be no direct correlation between ratings established for psychoses or neuroses in the VA system and ratings used here to describe flood disaster trauma.

33. For this reason, the AMA criteria for evaluating impairment due to psychoneuroses will be used for rating human impacts of flooding. The physiological and psychological impairment due to flooding is summarized in the trauma scale.

34. To apply values to this scale, we must establish compensation rates for various levels of impairment descriptive of each step. Table C-II lists the compensation payable for varying percentages of disability under the VA system.

Table C-II

COMPENSATION BY VETERANS ADMINISTRATION BY PERCENT DISABILITY

Degree of Disability Percent	Monthly Compensation
10	$ 44
20	80
30	121
40	166
50	232
60	292
70	346
80	400
90	450
100	890

Source: New York State awards, 1979 dollars

35. To assign values to the ranges established by the AMA for each classification, the median value of each range was determined and multiplied by the percentage rate of compenstion at that level. The resulting values are:

Class 1 - 0 to 5 percent impairment
no compensation

Class 2 - 10 to 45 percent impairment
$110.55 per month or $1,326.60 per year
(median = 27.50 X $4.02)

Class 3 - 50 to 95 percent impairment
$359.60 per month or $4,315.20 per year
(mediam = 72.50 X $4.96)

36. Since there is one-to-one correspondence between the AMA classes and the levels of the trauma scale, quantifying the trauma scale is fairly simple. It involves simply multiplying the number of individuals at each level of trauma by the value established. Summing these amounts over each level of trauma yields a total value representative of the willingness to pay to avoid the risk of trauma (in this case, through flood prevention) for a 1-year period.

37. The following quote from the AMA (1977) expresses the attitude taken in developing criteria for evaluating percent of impairment:

> Individuals differ greatly in the manner and degree with which they react to the stresses of day-to-day problems and life situations. The marshaling of the body reserves, the use of ego-protection devices, and the resort to regressive techniques are reactions used by everyone to varying degrees in his adjustment to reality. The degree to which these mechanisms are used furnishes a useful but imperfect basis for distinguishing between individual(s).

By accepting the AMA criteria as descriptive of the trauma scale, the inference may be that respondents in the Tug Fork Valley are being judged as permanently impaired. This was not our intent. Rather, we use the AMA criteria as a guide to determine reasonable compensation for what is probably a transitory, short-term effect in most cases. We expect these to vary with severity of the flooding experienced.

38. It was not possible in these early stages of research to have the household survey responses evaluated by a qualified psychologist. This would usually be done in order to use such information for actual compensation. Classification based on computer analysis of responses may be somewhat arbitrary but is similar to that done in studies by psychologists. However imperfect, this process does provide a basis for ranking flood victims from least affected to most affected.

39. Referring back to the previous section describing AMA ratings for impairment, it can be seen that each of these classes has been represented by a percentage impairment based on the state of mental well-being. Now the original levels of trauma can be expressed in terms of percents of psychic impairment

which can readily be translated into monetary compensation amounts based on Veteran's Administration awards for disability.

40. Using the trauma scale in which each level represents approximately a third of the household sample, compensation will be calculated as follows:

Trauma level:

Level I = 84 households = 181 individuals

Level II = 114 households - 369 individuals

Level III = 80 households = 291 individuals

Compensation:

Class 1: 181 individuals X no compensation = $0

Class 2: 369 individuals X $1,326.60/yr. = $489,515/yr.

Class 3: 291 individuals X $4,315.20/yr. = $1,255,723/yr.

Total compensation $1,745,238

41. How does the value of nonproperty damage estimated here compare with the property damage estimates developed by the Corps of Engineers shortly after the flood? We can assume that the 194 households in Class 2 and 3 above are representative of residences damaged by the 1977 flood. There will be a slight over-representation of households which suffered complete loss of their homes due to the unadjusted inclusion of the HUD trailers sample. However, this is probably balanced off by the choice of the more conservative distribution toward the Class 2 level of compensation in this example. Thus, we have an estimate of $1,745,000 per year for the nonproperty damages or $8,966 per household.

42. But how long did such trauma effects continue at this rate? Indicators for the trauma scale were identified for any time during the 2 years between the flood and the survey. It is likely that some of these effects of the flood lasted even less than the first year, and that many were well adjusted to by the end of the second year. But if this rate is applied for only 2 years, the total ($18,000) is substantially larger than the almost $9,000 per residential structure of property damage found after the flood. If this rate is applied to the more than 5,300 homes damaged or totally destroyed, we have a total trauma damage level of over $72 million. This compares with total physical damages of $126.60 million, business losses of $44.9 million, and emergency costs of $25.8 million.

Conclusions: Public Consequences and Planning Implications

43. The meaning of people's flood-induced resort to public assistance entitlements consists of several points. First, the data relating the individual's experiences with number of organizations contacted by the

individual dispels the notion of some critics that economic aid is generally sought by people who do not need it. The logic of these data suggests that those who seek help need it. By the relative magnitude of impact suffered, and fragility of preflood self-sufficiency, they apparently tend to ask in degrees inverse to their actual ability to help themselves. The protection of people exhibiting this general pattern of behavior would constitute avoidance of a present recovery cost which is founded on genuine harm to individuals. The current cost is not liekly to be reduced by denial.

44. A second point of meaning to public assistance costs is also more apparent when observing data on the human behavior process in interaction with destructive natural causes. If people are considered as human resources from either a social system or an economic perspective, then the public entitlement funds paid for emergency and recovery costs are maintenance costs. Damage to housing, furniture, appliances, etc., are an impairment in support facilities which are required to sustain individuals and households at some acceptable level of contribution to their own viability for work, and to the economy.

45. What these recurring emergency and recovery costs mean, in merely trying to keep people as human resources at some minimum constant level of viability, is a third point. The output of human resource maintenance and productive potential is very likely a value which cannot (within reasonable investigative limits) be reliably determined by either the "willingness to pay" or the "net income" method on behalf of any proposed plan. At best, only fragments might be captured by these methods. But there is applicable WRC guidance providing an empirical approach which applies to a public act of human resource maintenance:

> "The cost of the most likely alternative means of obtaining the desired output can be used to approximate total value when the willingness to pay or change in net income methods cannot be used. The cost of the most likely alternative . . . merely indicates what society must pay by the next most likely alternative to accrue the output . . .. This assumes, of course, that society would in fact undertake the alternative means."*

46. The "most likely alternative" to any plan involving Federal action to avoid human resource impairment costs in Tug Fork is the NO ACTION plan, i.e., the present conditions or the "without project" condition. It need not be assumed that society would be willing to undertake this alternative (to avoidance of harm) at some estimated cost. Society <u>has</u> undertaken it, in the absence of other remedy, in the 1977 flood at an emergency and recovery cost of 25.8 million dollars, and at other cost magnitudes in many previous floods. The point of tracing this parallel between the usual accounting of emergency cost "damages" on the one hand, and the human resources impairment--maintenance perspective of socioeconomic analysis on the other, is <u>not</u> to suggest double counting of the 25.8 million dollars. It has been done for two positive reasons:

*Water Resources Council, "Proposed Revisions to the Principles for Planning Water and Related Land Resources," <u>Federal Register</u>, Vol. 44, No. 102, p. 30248 (Thur., May 24, 1979).

47. The first is to demonstrate how the initially posed parallel between a human resources maintenance interpretation and the usual emergency-recovery interpretation can be carried through, on evidence, to the same end cost. The second reason is that the equally sound human resources interpretation, ending in the "same" cost for recovery, rather strongly suggests some further implications for the Nation which the "repeated cure" emergency recovery conceptualization of costs does not.

48. In the context of much data from many sources, and the resulting general observation about the effects of recurrent flooding in the Tug Fork Valley, the human resources perspective directly suggests a rising curve of cost for human maintenance. What most long-term observers--Federal, State, and local--have agreed is that both property and the quality of life are deteriorating under the cumulative effect of successive floods. Rehabilitative and compensatory funds are not effectively holding the economic system and social organization of the communities at some identified previous level. Nor are they preserving some minimum satisfactory qualitative state or level of active developmental capacity, set by conscious public policy.

49. All local effort and received funding are expended on the objective of "keeping even." This is failing, over time, despite the optimistic cleanup and recovery appearances in the short run after the point even of any single flood. In a context of declining material resources and community organizational capability for action, what of the resourcefulness of the individuals whose perceptions, attitudes and behavioral dispositions are--in creative and productive orientation--strongly influenced and set in their constraints by such contextual factors?

50. The clear implication is that the effective capacity of individuals for both self-sufficiency and contribution to growth and development decreases along with the material base and social infrastructure through which they must act to achieve those productive ends. In short, there is a downward "rachet" effect, a cumulative decline in the human resource capacity (capital) of the sum of individuals, which parallels that of declining and deteriorating property.

51. What this downward curve in wealth, organizational capacity, and psychological perception of rational opportunity means for the de facto policy of emergency recovery is that, over the time span of recurring flood events, it is a sound projection to expect an ever-increasing cost level to recover an ever-declining resource in human capacities. There is some point of intersection in judgment consensus, if not precise measurement, where the cost becomes a welfare burden on behalf of a depleted, dependent population, and ceases to be an investment in recovery of the productive capacity of a viably organized socioeconomic system of individual skills, learning abilities, and motivation. General indicators would suggest that this intersection of declining resources and rising public "recovery" costs (creating an inadvertent welfare policy toward flooding) is not far ahead in the Tug Fork Valley.

52. The data on household economic response behaviors have demonstrated that flood experiences do cause adjustive responses among expenditure items. Generally, savings decline, consumer credit debt is increased, forms of

insurance increase, and the restrictive impact on consumption spending is about twice that of inflation. To this may be added, of course, obligation to Government recovery loan repayments. These changes are, by circumstance, a disruptive effect in that they arise deterministically from a negative event and are not freely chosen acts of persons who engage in them.

53. Here, the data stop on the "human behavior response to flooding" process. This sequence of description and reasoning is not primarily to validate a conceptual interpretation (as with public assistance), but to empirically establish a previously unmeasured effect. Hence, here also stops direct evidence to confirm further consequences of a purely economic, rather than an aggregate behavioral kind, such as observed to this point.

54. However, the limitation is only in the available time, scope, and data of this investigation into behavioral evidence for impairment of people as human resources. A concern with the economic effects, beyond the household allocation of income, shown as behavioral responses here, points straightforwardly to some specific steps into primary economic inquiry. The question of indirect costs in external diseconomies is at issue, and it is a legitimate item of accounting in the Corps' cost/benefit calculation procedure.

APPENDIX D

INTERVIEW FORM

FOR JACKSON DAMAGE SURVEY

JACKSON, MISSISSIPPI FLOOD SURVEY
RESIDENTIAL SCHEDULE

INTERVIEWER:_____

SCHEDULE NO.:_____

DATE:_____ (TIME:_____)

NAME OF RESPONDENT_____

ADDRESS_____

_____

Zip_____

PHONE NO.:_____

1. Were you living at this address during the time of the Flood in May, 1983?
_____ Yes _____ No

If no, stop interview - thank respondent and select an alternative replacement

2. Was your house flooded during the May 1983 Flood?
_____ Yes _____ No

If no, stop interview - thank respondent and select an alternative replacement

3. During the flood of May, 1983, did you have flood waters on your land?
_____ Yes _____ No _____ Don't know/no response

4. During the flood of May, 1983, did water entered your house?
_____ Yes _____ No

5. How deep was the water in your house? _____

(Interviewer is to request the specific information to fill out the chart on the following page. This material is very important to the study, so probe to achieve accuracy in determining dollar cost damage to both the structures and contents. See Form X on next page).

6. If your place of residence suffered any flood damage, what would you estimate to be your total man hours of labor involved in "clean-up"? (this doesn't include the hours of any persons you might have hired for the job such as painters, electricians, etc.)

Total Man Hours _____

7. Was the flood of May, 1983, the first time you exerienced flooding at this address?
_____ Yes _____ No _____ Don't know/no response

If no , when was the previous flooding? Date _____

8. Composition of household at the time of the flood of May, 1983.
_____ husband _____ age
_____ wife _____ age

9. Were you and/or other members of this household employed at the time of the May 1983 flood?

husband employed:	Yes _____	No _____
wife employed:	Yes _____	No _____
Others employed:	Yes _____	No _____

If yes, did any of these employed miss work on the day of the flood and or days later (exclude being "laid off")
yes (specify reason) _____
No _____
don't know/no response _____

FORM X

Type of Building[1]		Valuation of Structural Damage (if respondent is renter, skip this column)[2]	Valuation of Damage to Contents of Bldg.[3]	Depth of water in each bldg. (Indicate + if above floor level of first floor and - if below first floor level)[4]
A (main bldg)		Amt. $ Specify	Amt. $ Specify	
B (Specify)		Amt. $ Specify	Amt. $ Specify	
C (Specify)		Amt. $ Specify	Amt. $ Specify	
D (Specify)		Amt. $ Specify	Amt. $ Specify	
E (Specify)		Amt. $ Specify	Amt. $ Specify	

+8'
+7'
+6'
+5'
+4'
+3'
+2'
+12"
+6"
0 (1st. floor level)
-1'
-2'
-3'
-4'
-5'
-6'

[1]Specify what each bldg. is--i.e., residence, detached garage, guest house, tool shed, etc.

[2]Determine $ damage to structure (which includes carpet, furnace, built-in appliances, air conditioners, etc.), and specify how figure was arrived at (such as repair/replacement costs, insurance collected, etc.).

[3]Determine $ damage to contents of all buildings or property (appliances, furniture, recreational equip., tools, personal items, clothes, and excluding vehicles, campers, etc. and specify how figure was arrived at--such as repair/replacement costs, insurance collected, etc.).

[4]Water depth in bldg. (Indicate depth of water above or below first floor level = 0 for each bldg.).

10. Did you (or any member of this household) lose your job as a result of the flood?

_____ Yes _____ No _____ Don't know/no response

11. Were you or any member of the household temporarily laid off from work as a result of flood damage at the place of employment?

_____ Yes _____ No _____ Don't know/no response

If yes, what were the total lost wages for the household? $_____

12. Which of the following were you seriously worried about?

Damage to personal property and belongings Yes _____ No _____
Injury to self or other household members Yes _____ No _____
Damage to relatives' (not in household) property belongings Yes _____ No _____
Injury to relatives (not in household) Yes _____ No _____
Damage to friends/neighbors property/belongings Yes _____ No _____
Injury to friends/neighbors Yes _____ No _____
Other (specify) _____

13. During the flood how anxious nervous or upset were you?

_____ very anxious/upset
_____ somewhat anxious/upset
_____ not at all anxious/upset

14. Did you evacuate your home at any time?

_____ Yes _____ No _____ Don't know/no response

15. For how long were you out of your home?

for the day only Yes _____ No _____
overnight Yes _____ No _____
Days _____
Don't know/no response _____

16. At the time of or immediately following the flood did your household undergo any looting?

_____ Yes (specify)_____ $_____
_____ No
_____ Don't know/no response

17. How would you describe the feelings of neighborliness in this neighborhood before the flood?

weak feelings Yes _____ No _____
average feelings Yes _____ No _____
strong feelings Yes _____ No _____
Don't know/no response _____

18. What about after the flood? Do you feel neighborliness increased, decreased, or stayed about the same? (frequency of disagreements, arguments, getting together or visiting, borrowing, etc.)

increased neighborliness Yes _____ No _____
decreased neighborliness Yes _____ No _____
stayed about the same Yes _____ No _____
Don't know/no response _____

19. How would you say your physical health has been since the flood as compared to before that time?

much worse Yes _____ No _____
a little worse Yes _____ No _____
about the same Yes _____ No _____
a little better Yes _____ No _____
much better Yes _____ No _____
don't know/no response _____

20. Do you think or daydream or have night dreams about the flood? (circle which)

_____ no not at all
_____ Sometimes
_____ Often
_____ I did at first (used to) but not now
_____ don't know/no response

21. Do you feel more anxious, nervous, or upset when it looks like bad weather -- than before the flood?

_____ a lot more nervous
_____ somewhat more nervous
_____ a little more nervous
_____ no
_____ at first more nervous, but not now
_____ don't know/no response

22. In general, how have you felt emotionally or mentally since the flood as compared to before?. Would you say: (read out)

_____ much better
_____ about the same
_____ not as good
_____ much worse
_____ don't know/no response

23. What about other members of the household. Did any of them have any physical kinds of reactions as a result of the flood.

_____ Yes _____ No ____ Don't know/no response

relationship _____ age _____
symptoms _____
_____

relationship _____ age _____
symptoms _____
_____

24. Have you or any members of your family had to seek professional help for emotional or physical problems since the flood which you believe might be related to your flood experience?

Yes (specify)

relationship _____ age _____
type of help _____
_____

relationship _____ age _____
type of help _____

25. In order to assess individual's ability to adjust to disaster losses. What would you say your income for 1983 was?
Husband _____ Wife _____

26. Highest level of education completed by male head of household (circle appropriate number)

1 2 3 4 5 6 7 8	9 10 11 12	1 2 3 4	MA. JD. MD. PhD.
GRADE SCHOOL	HIGH SCHOOL	COLLEGE	PROFESSIONAL

27. Highest level of education completed by female head of household (circle appropriate number)

1 2 3 4 5 6 7 8	9 10 11 12	1 2 3 4	MA. JD. MD. PhD.
GRADE SCHOOL	HIGH SCHOOL	COLLEGE	PROFESSIONAL

28. I would like you to read these numbered statements and tell me how you feel about each statement - whether you strongly agree/agree/undecided/ disagree/strongly disagree

	strongly agree	agree	undecided	disagree	strongly disagree
1.					
2.					
3.					
4.					
5.					
6.					
7.					
8.					
9.					
10.					
11.					
12.					

29. Has the flood had an effect on your way of life in any way - either short term or long term effects?

_____ Yes _____ No effect _____ Don't know/no response

If yes, please specify:

Short term effects	Long term effects
A)	A)
B)	B)
C)	C)

30. How long did it take for things (your routines, work, business, etc.) to "get back to normal" after the flood?

_____ hours (day or less)
_____ several days (a week or less)
_____ several weeks (a month or less)
_____ several months
_____ still not back to normal
_____ don't know/no response