

A SYSTEMS MODEL OF THE POST-DILUVIAL EXPANSION  
OF THE NATIONAL  
FLOOD INSURANCE PROGRAM IN LEWISTOWN, PENNSYLVANIA

by

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# A SYSTEMS MODEL OF THE POST-DILUVIAL EXPANSION OF THE NATIONAL FLOOD INSURANCE PROGRAM IN LEWISTOWN, PENNSYLVANIA

**ABSTRACT:** Expansion of the National Flood Insurance Program is described in the context of a modification of Kates' Systems Model of Human Adjustments to Natural Hazards for a small central Pennsylvania town (1970 population=11,098) that became eligible for flood insurance four months after experiencing five million dollars in flood damage and the loss of 2,200 jobs as the result of floods from Tropical Storm Agnes (June 1972). Primary data for the model came from a questionnaire mailed six months after the flood to a spatially stratified random sample of households with pre-flood addresses in the flood area (N=856, n=193, returns=147 or 76.2%).

Floods at Lewistown are infrequent, severe, and associated with extreme meteorological events. A partially completed flood control reservoir (Raystown Dam) reduced flood levels at Lewistown. A flood warning of twenty-four hours enabled residents to elevate and evacuate personal property.

Tenure influenced the decision of households to live at their pre-flood houses after the flood; homeowners=97%, renters=55%. Flood damage influenced the purchase of flood insurance: 3/4 with damage greater than \$5,000, only 1/3 with damages between \$2,500 and \$5,000. The forgiveness value of Small Business Administration Disaster loans (\$5,000) affected insurance decisions.

Land use control of the flood insurance program are influencing efforts to redevelop the flooded area.

Suggested as new directions of research are a causal model of insurances purchases and a decision tree of the insurance decision.

## INTRODUCTION

"... where swept the waters of the beautiful Blue Juniata."  
M.D. Sullivan (1836)

The establishment of the Flood Plain Information Program in the U. S. Corps of Engineers in 1960 marked the initiation of important Federal action intended to reduce flood losses by influencing the behavioral and institutional patterns of adjustment to flooding. Former policies almost exclusively promoted structural



(technological) adjustments: dams, levees, floodwall, etc. The extent of this new direction is revealed in House Document 465 released in 1966. Entitled A Unified National Program for Managing Flood Losses: Communication from the President of the United States transmitting a Report by the Task Force on Federal Flood Control Policy, this document recommended 53 specific actions by various federal agencies. By 1971, 75% of these recommendations, generally those not requiring interagency cooperation, had received substantial attention.<sup>1</sup> The most innovative, by its possible ramifications, of the realized recommendations was the establishment of a National Flood Insurance Program.<sup>2</sup>

#### The National Flood Insurance Program

The program is administered by the Federal Insurance Administration (FIA) in the Department of Housing and Urban Affairs (HUD) in cooperation with a pool of companies in the insurance industry. The goals of this new program were interpreted by a FIA official at a Flood Insurance Workshop in 1971. He said, "Designed to make at least partial flood insurance coverage available against property losses caused by floods, the long range goal of the program is to reduce or prevent future flood losses through improved flood plain management."<sup>3</sup> The FIA has promulgated these long range goals by requiring each community that applies for Flood Insurance coverage agree to adopt and enforce land use measures consistent with Federal criteria. These criteria are based on the statistical and hydrological

characteristics of each flood plain. Riverine flood plains are first mapped by a Federal agency, usually the U. S. Corps of Engineers, the U. S. Geological Survey or the U. S. Soil Conservation Service. These maps are similar to those found in Flood Plain Information Reports of the above mentioned agencies. The principal mapping difference is in blocking of flood boundaries for flood insurance studies.<sup>4</sup>

A completed mapping project will have separated the flood plain into three hazard zones, the floodway, the area of special flood hazard, and the area of no special hazard. The floodway is designated as the channel and adjacent land area required to carry and discharge a flood of a given magnitude. Adjacent to the floodway the area extending out to include the maximum area of the flood plain that, on the average, is likely to be flooded once every 100 years is designated as the area of special flood hazard. The remainder of the flood plain is designated as an area with no special flood hazard.

Federal land use criteria for flood plain management is then interpreted for each flood hazard zone. As listed in the Federal Register they state:<sup>5</sup>

- Require new construction or substantial improvements of residential structures within the area of special flood hazards to have the lowest floor (including basement) elevated to or above the level of the 100-year flood;
- Require new construction or substantial improvements of nonresidential structures within the area of special flood hazards to have the lowest floor (including basement) elevated to or above the level of the 100-year flood or together with attendant utility and sanitary facilities, to be floodproofed up to the level of the 100-year flood;

- Designate a floodway for passage of the water of the 100-year flood. The selection of the floodway shall be based on the principle that the area chosen for the floodway must be designated to carry the waters of the 100-year flood, without increasing the water surface elevation of that flood more than one foot at any point;
- Provide that existing nonconforming uses in the floodway shall not be expanded but may be modified, altered or repaired to incorporate floodproofing measures, provided such measures do not raise the level of the 100-year flood; and,
- Prohibit fill or encroachments within the designated floodway that would impair its ability to carry and discharge the waters resulting from the 100-year flood, except where the effect on flood heights is fully offset by stream improvements.

These requirements may be altered for a local community if they can be shown to be premature or uneconomic.

These regulations are inhibiting rapid expansion of the Flood Insurance Program as communities are unwilling to lose tax revenues by regulating flood prone properties. A provision limiting the availability of disaster loans for participating communities reduces the attractiveness of the program.

#### Post-Diluvial Expansion of the Flood Insurance Program

The program is never-the-less expanding. Most of this expansion, however, occurs after a major flood is experienced. Characteristics of this post-diluvial expansion are examined in this report.

Hurricane Agnes (June 1972) was the most destructive natural disaster in United States history.<sup>6</sup> Although reduced to a Tropical

Storm once inland, the resultant rainfall produced massive flooding in eastern states, particularly Pennsylvania. As communities recovered new choices of adjusting to future floods were promoted, investigated and sometimes accepted. Prominent among those that were accepted was the National Flood Insurance Program.

### The Study Area

The character of the acceptance of Flood Insurance was studied in the community of Lewistown, Pennsylvania. (Figure 1) One fourth of the developed area of this community was underwater during the June 1972 flood. The compactness of settlement in the flood plain provided an excellent site to study residential acceptance of flood insurance. Three other reasons enhanced the selection of Lewistown as the study area. First, Lewistown represents a town that is protected by a Flood Control Reservoir operated by the Corps of Engineers. It is unlikely that any new structural measures of any appreciable size or consequence would be found economically feasible and constructed to increase the flood control at Lewistown. Therefore, adjustments to flooding would have to occur in the non-structural realm. Secondly, as a result of the damage experienced in the June 1972 flood the main employer in the community, the FMC-Viscose Corporation, permanently reduced the scale of its operation at Lewistown. This action left 2,200 workers without jobs. Would the loss of income influence the purchase of flood insurance? Thirdly, the author's familiarity with the community (his home town) would facilitate the objectives of the study.

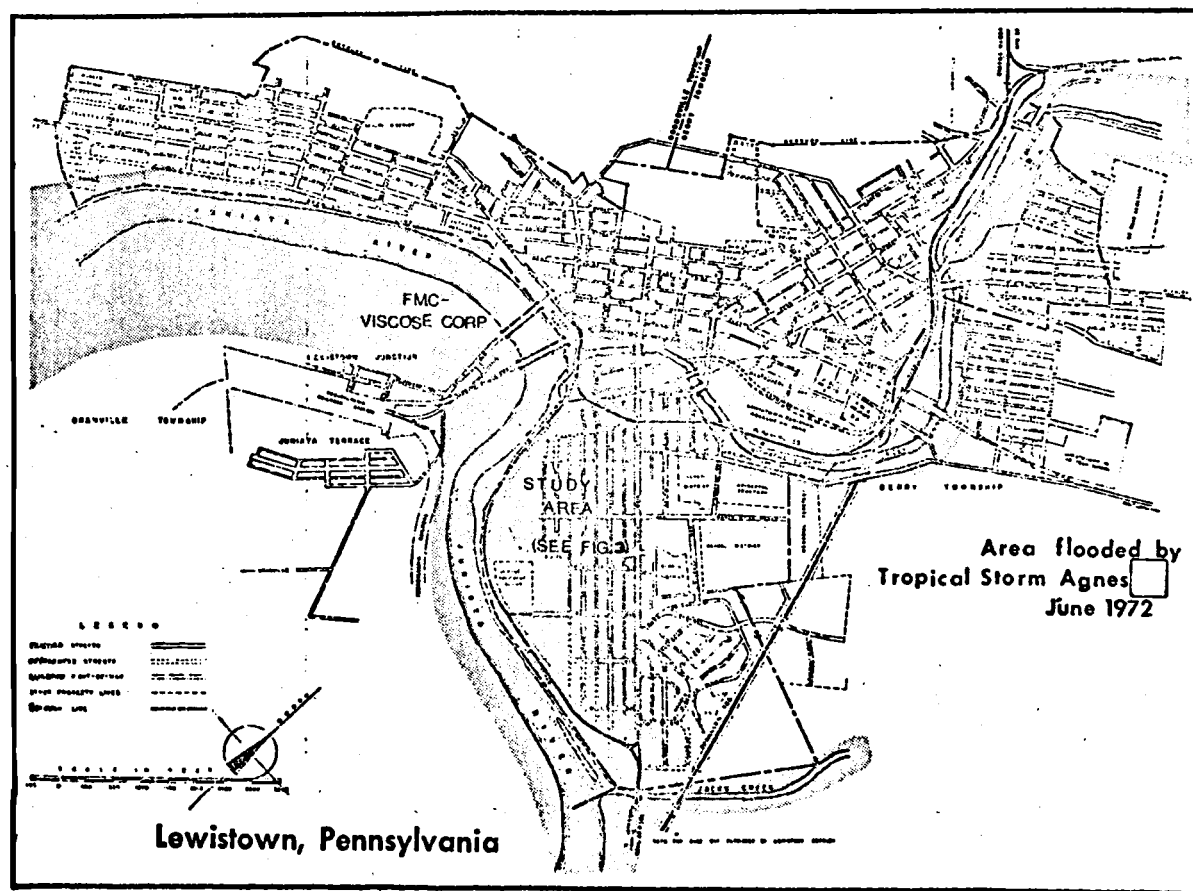


Figure 1

### Objectives of the Study

The objectives of this study are: 1) to develop a general systems model of adjustments to flooding in Lewistown, Pennsylvania that portrays relationships among those variables suspected of influencing the residential choice of adjustment to flooding (particularly flood insurance); 2) to determine the characteristics of the variables and relationships by sampling the residents of the study area; 3) to gain insights of other relationships and variables not initially included in the model; 4) to determine which variables significantly influence the decision to purchase flood insurance; 5) to observe any means to further expand the flood insurance program and to promote sales; and 6) to suggest directions for additional research.

### MAIL SURVEY OF FLOOD PLAIN RESIDENTS

In keeping with the objectives of the study it was decided that a mail survey of flood plain residents would be the most efficient and economical method to gather the large amount of information required by the model. Although other techniques were employed, the results of the mail questionnaire provided the bulk of the original information of this report.

### Questionnaire Development

After first preparing a model of the adjustment process, a series of questions were developed. A search through the psychological

literature did not uncover consistent methods for using mail questionnaires to isolate and measure psychological variables. Nevertheless, the desire to determine the risk taking attitudes of household decision-makers prompted the inclusion of a scaled attitude test in the final questionnaire.<sup>7</sup> Unfortunately, this portion of the questionnaire produced inconsistent and unusable information. Consequently, these results are ignored in further reporting. Perhaps the only positive point is the realization that psychological variables are very difficult to measure by a mail questionnaire.

A preliminary questionnaire was pretested by a group of Lewistown residents. During the review period the situation in Lewistown changed necessitating a revision of the questionnaire. This revision did not have the benefit of pretesting.

The questionnaire was prepared in booklet form. Each question was supplied with a list of possible answers. Respondents, therefore, had only to mark the item that best answered each question. To encourage the completion of the questionnaire each question also had as a possible answer, "don't wish to answer." This choice enables an individual to complete the questionnaire without forcing an informative response to any particular question.

A cover letter accompanied each questionnaire. The cover letter explained the purpose of the study and requested that the recipient respond. On the back of each cover letter was a map showing the flooded area of Lewistown and an article about the study from the local newspaper. Also included was a stamped, addressed envelope.

The questionnaires were mailed from Lewistown during the last week in December 1972, six months after the flood. Three weeks later a follow-up questionnaire was mailed. The form of this and the next (and last) follow-up differed from the original questionnaire. These questionnaires were simply colored 8 1/2 x 11 forms (pink-first follow-up, blue-second follow-up) that asked fewer questions but required that respondents write in their answers. The last follow-up was sent six weeks after the original. (See Appendices A, B, C for these questionnaires.)

### Sampling Strategy

A map that delineated the extent of flooding in Lewistown was graciously provided by the Mifflin-Juniata Planning Commission. Through the use of the map, a study area was established in the flooded area. This area included all residences located south of Kishacoquillas Creek within both the Borough of Lewistown and the delineated flood area. (Figure 2)

The map supplied by the planning commission also contained five foot contour lines which were used to stratify the study area into three flood hazard zones (A, B, and C). (Figure 2) This stratification insured that the sample, when drawn, would be a spatially stratified random sample.<sup>8</sup> Because flood frequency and damage, both of interest in this study, are associated with elevation, this kind of stratification by street level was employed.

Stratum A is located closest to the water bodies. This stratum encompasses all residences living on streets with elevation less than



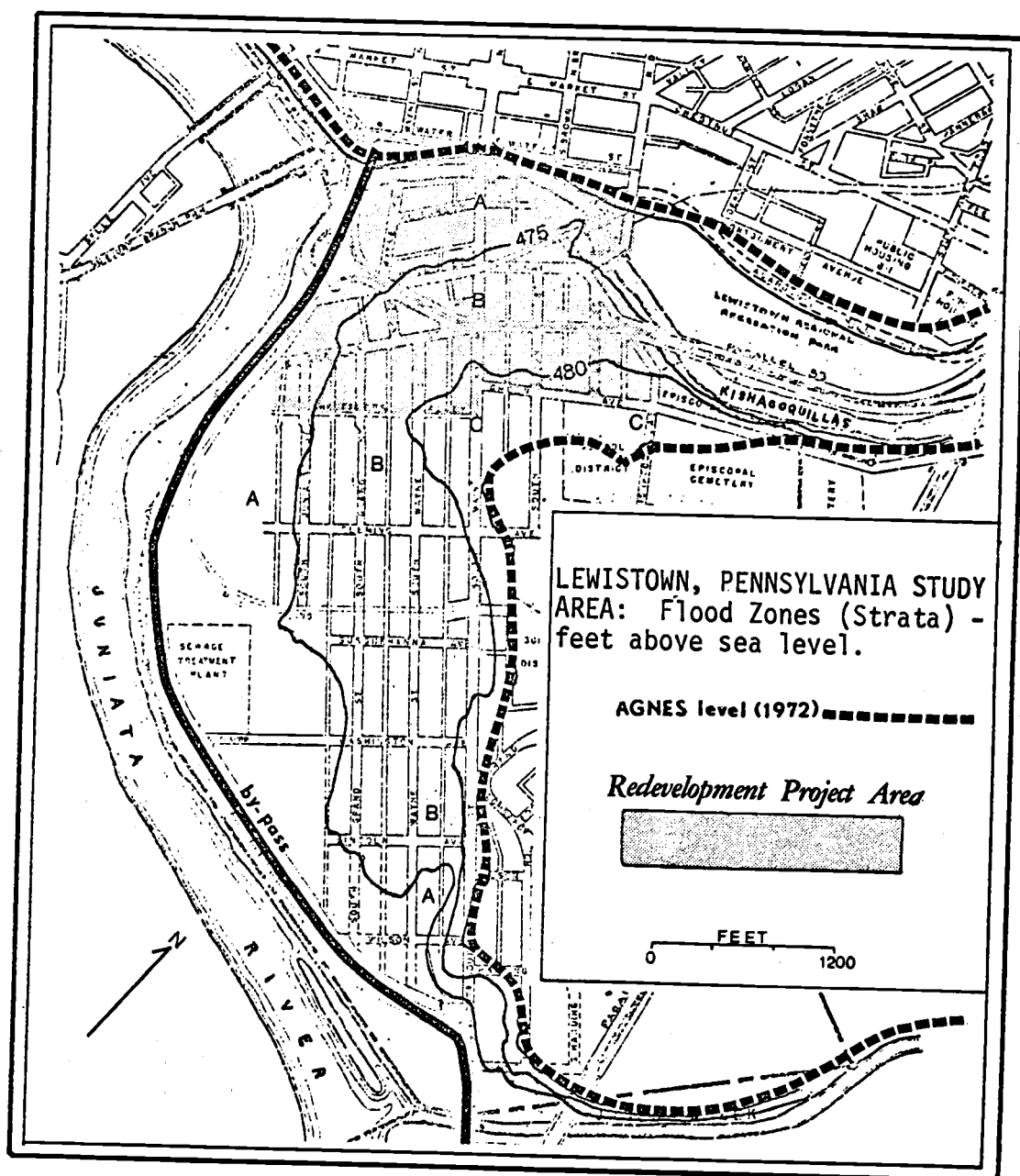


Figure 2

475 feet above mean sea level (USGS). The 475' contour line corresponds well with the 20-year flood level (unregulated by Raystown Dam). Stratum B includes those residences located between elevations 475 and 480 feet above sea level (USGS). The 480' contour line corresponds well with the 100-year flood level (unregulated). The remainder of the study area is included in Stratum C. (Figure 2, p. 10)

A sampling frame was developed using the City Directory of Lewistown, Pennsylvania.<sup>9</sup> Kish found that city directories omit households only five percent or less on the average. The percentage of omission; that is, the failure to list households actually living in the area encompassed by the city directory, is subject principally to the age of the directory.<sup>10</sup> Because the City Directory of Lewistown had been revised a few months before the flood, it was considered an excellent source.

Using the city directory, lists of the residents within each strata were prepared. Each resident within a stratum was numbered and a random numbering table was consulted to determine those households to be included in the sample. The number of households selected from each stratum was proportionate to the total number of households within a stratum for B and C and twice the proportion for A. The doubling for A was done in order to compensate for the expected difficulty of reaching households that had moved from the area that experienced the most severe flood damage.

After the selection of the sample, 193 questionnaires were mailed. These 193 represent only 23% of the 856 households with addresses in the study area. With 100% response this sample size contains an estimated sample error of about 5%. (Table 1)

TABLE 1 - THE LEWISTOWN, PENNSYLVANIA STUDY AREA: MAIL  
QUESTIONNAIRE DISTRIBUTION AND RESPONSE

Population:	Households in the study area (856)			
Sampling Frame:	<u>The City Directory of Lewistown, Pennsylvania</u> prepared by Calkin-Kelly Directory Company, Binghamton, New York (Spring 1972)			
Sampling Unit:	Households (193 in sample)			
Item	Stratum A	Stratum B	Stratum C	Total For Study Area
Number of Households	72	590	194	856
Percentage of total households in study area	8.4%	68.9%	22.7%	100.0%
Number of Question- naires mailed	30	119	44	193
Percentage of house- holds in strata	42.0%	20.0%	23.0%	23.0%
Number of Question- naires returned	19	93	35	147
Percentage returned	63.3%	78.1%	79.5%	76.2%
Percentage of stratum population represented by returned question- naire	26.4%	15.8%	18.0%	17.2%

Source: Compiled by author.

### Questionnaire Returns

Of the 193 questionnaires mailed, 147 or 76.2% were returned. The return rates differed from each stratum with Stratum A having the lowest (63.3%). (Table 1) The 19 questionnaires returned from households with a pre-flood address in Stratum A, however, represent 26.4% of the total households of the stratum. Returns from households listed in strata B and C were less; 15.8% and 18% respectively. The overall population of households is then represented by a sample of 17.2% of their members. Therefore, any characteristic represented by at least 10% of the population of households will be identified in the sample.<sup>11</sup>

The unusually high return rate for a mail questionnaire can be attributed to several factors. Respondent interest in the flood situation in general is probably the most important. This is negated somewhat by the fact that other surveys were being taken in this area. The completion of one more questionnaire may have been onerous for many households. But the attractive, relatively short, and straightforward questionnaire, along with the cover letter, may have considerably reduced any reluctance.

Two other techniques were important in increasing questionnaire returns: personal contact and publicity. During the week in which the questionnaires were mailed, an attempt was made to reach someone in each of the sampled households. Those contacted by telephone were asked, "Are you having any difficulty in completing the questionnaire about your activities since the flood?" Approximately 80% of all households were contacted in this manner. The city editor of the

Lewistown evening newspaper, The Sentinel, reported in his local events column that a study of the activities of households since the flood was being conducted in the community.

### Bias and Nonrespondents

Bias is introduced into questionnaire results by nonrespondents. The absence of this group leaves the sample without the information and attitudes necessary to be representative of the entire population. Lehman suggests that nonrespondents share many characteristics with late respondents.<sup>12</sup> A comparison of replies from the original and follow-up questionnaires does reveal large proportionate difference in two characteristics: home ownership and the percentage of households that returned to live at their pre-flood address and bought flood insurance. (Table 2) If the nonrespondents are similar to late respondents, it would appear that the sample is over represented by homeowners and households that decided to purchase flood insurance; two apparently related phenomena. Homeowners would be more likely to return after the flood and purchase flood insurance than renters. Another point, households that left the flood area would be more difficult to locate through the mail. Actually, only two original questionnaires were returned marked "Addressee Unknown," indicating that most of the original questionnaires reached the sampled households.

The distribution of nonrespondents into two groups (homeowners and flood insurance purchasers) can be done by weighting the number of nonrespondents by their proportion as measured in follow-up

questionnaires. Forty-six (46) of the households or 23.8% of the sample chose not to respond to the questionnaire. To estimate the proportion of homeowners in this group of nonrespondents, the percentage of homeowners in the late respondent group (total from both follow-ups) is multiplied by the number of non-respondents ( $0.40 \times 46 = 18.4$ ). (Table 2) These 18 households are then included with the homeowners. Survey returns report that 85 households or 60% of the population are homeowners. But after incorporating the 18 households predicted to be homeowners from nonrespondents, the percentage of homeowners drops to 53%. This small change (7%) does not seem to warrant a revision of the survey results. Thus throughout the rest of the paper the questionnaire results will be considered as representative of the population of households with addresses in the study area.

A word of caution is in order lest it be construed that there is unanimity of opinion about the worth of comparing nonrespondents with late respondents. Ellis flatly states that late respondents do not provide a suitable basis for estimating the characteristics of nonrespondents.<sup>13</sup> And Franzen found that consistent and statistically significant differences exist between respondents and nonrespondents.<sup>14</sup> A middle of the road position on this issue is taken by Ferber, who recommends that if replies do not appear to differ between the original and late respondents there may not be much bias in the sample.<sup>15</sup> Obviously with this range of opinion much more research should be undertaken.

TABLE 2 - THE LEWISTOWN, PENNSYLVANIA STUDY AREA:  
COMPARISON OF RESPONSES TO THE ORIGINAL  
AND FOLLOW-UP QUESTIONNAIRES

Item	Response to the Original Questionnaire	Response to Follow-up Questionnaires		Follow-up Totals	Difference (1) - (4)
		First	Second		
	(1)	(2)	(3)	(4)	
Number returned	117	22	8	30	
Percentage of all returned	79.6%	15.0%	5.4%	20.4%	59.2%
Percentage of those mailed	60.0%	28.9%	14.8%	23.1%	36.9%
----- Comparison of Responses -----					
Percentage of households:					
that are home- owners	63.2%	54.5%	0.0%	40.0%	23.2%
living in study area less than five years	29.0%	27.3%	50.0%	33.3%	-4.4%
receiving more than \$5,000 flood damage	77.8%	75.8%	37.5%	70.0%	7.8%
receiving SBA loans	83.8%	90.1%	37.5%	76.7%	7.2%
Percentage of loss of employment related to flood	12.8%	13.6%	0.0%	10.0%	2.8%
Percent returning to live at pre-flood address	81.2%	77.3%	62.5%	73.3%	7.9%
Percentage of house- holds who returned to live at their pre-flood address and bought flood insurance	56.8%	29.4%	0.0%	20.0%	36.8%

Source: Compiled by author from survey results.

## A SYSTEMS MODEL OF THE POST-DILUVIAL EXPANSION OF THE NATIONAL FLOOD INSURANCE PROGRAM IN LEWISTOWN, PENNSYLVANIA

A model of a system is a theory of the system.<sup>16</sup> Isolating and conceptualizing subsystems and their functional elements provide a means to create order out of what might appear to be unrelated events. Arranging the subsystems to describe the strength and direction of the linkages between them, establishes a means to simulate the processes that underlie the elements and linkages. However, most models are not able to predict the outcomes of process for which Man lacks a firm theoretical understanding. This is the case with human adjustments to natural hazards. But, models do provide a means to identify critical data even if it is only by its absence.<sup>17</sup>

The model of adjustments to flood hazard in Lewistown, Pennsylvania is derived from the General Systems Model of Human Adjustments to Natural Hazards developed by Robert Kates of Clark University.<sup>18</sup> The qualities he advises in a model for hazard research (parsimony, flexibility, and esthetics) were sought in constructing the Lewistown model. But simplification, necessary in the model, has seriously compromised reality. The complex process of adjustments to flooding have been reduced to a sequence of steps. But even in this crude form, the model involves an understanding of systems, collection of data and knowledge of functional relationships.

### Operation of the Adjustment System

A general systems model should be seen as systems operating within systems (a functional hierarchy). The magnitude of an element within



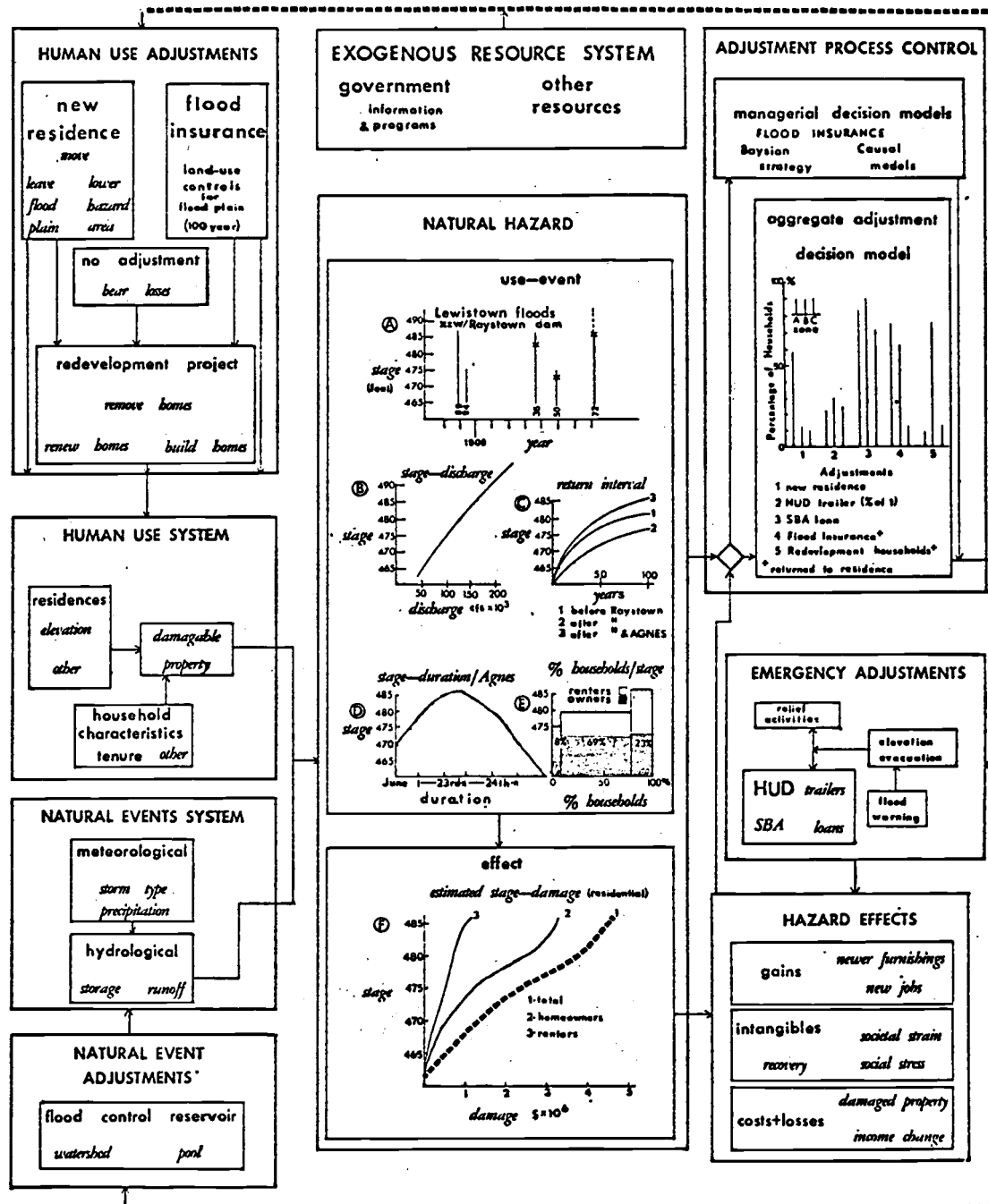


Figure 3: A SYSTEMS MODEL OF THE POST-DILUVIAL EXPANSION OF THE NATIONAL FLOOD INSURANCE PROGRAM IN LEWISTOWN, PENNSYLVANIA

one system can influence the dynamic processes of another. The conceptual operation of the adjustment system can be quickly grasped by reviewing the structure and linkages of the major subsystems.

(Figure 3)

The Human Use System is described in terms of the smallest unit of occupancy capable of independent and indivisible decision making relative to adjustment adoption - the household.<sup>19</sup> Households are described in terms of number, size, length of residence, location of residence and property tenure. (In this report the term resident is equivalent to household.)

The Natural Events System is described in terms of the hydrological and meteorological circumstances that have produced flooding in the drainage basin. Storm and flood histories, conditions of ground cover, basin topography, stream patterns, regional climate and characteristics of the Juniata River are used to describe this system.

The Natural Hazard System describes a range of uses and events that might combine with a predicted effect. In this system the use is described as that just prior to the event - the Agnes Flood of June 1972. The characteristics of this particular use-event are presented as a series of graphs, which are discussed throughout the report. The technique used to develop the stage-damage curve is also reviewed.

The Hazard Effect System is described as the effect a particular or a range of natural hazards (use+event = effect) has on the households and their operational milieu. The costs, losses and gains from a particular natural hazard are influenced by the emergency

adjustments that are made just prior to, during or immediately after a natural hazard has occurred.

The Emergency Adjustment System is described in terms of the rapid life sustaining, property protecting activities that were undertaken by households or for households during the disaster period. The magnitude and timing of the elements of this system influence the magnitude and duration of the elements of the Hazard Effects System.

The Adjustment Process Control conceptualizes those activities that are initiated by the magnitude, frequency and distribution of the elements in the Hazard Effects System. The Process Control is described in terms of the aggregate adjustments made by the households of the flood area and as personalized managerial decision models. A Bayesian strategy for purchasing flood insurance is investigated in a normative setting. And a Causal model, based on questionnaire data, is then suggested.

The Exogeneous Resource System includes those governmental resources that were made available to households in the community only because of the disaster situation. As with the other systems in the model of adjustments to flooding, this system is heuristic and goal seeking. The capacity to incorporate new information, to proceed in a variety of often conflicting directions, and to change is the pattern and functional process of this system. Throughout the remainder of this report elements of this system will be discussed where appropriate.

The Natural Events Adjustments System contains the range of theoretically possible adjustment choices available to decision makers. The selection of a particular adjustment is contingent upon forces exterior to the decision maker. This system is discussed in terms of the structural changes that have been proposed or constructed for flood control in the drainage basin.

The Human Use Adjustment System contains a range of theoretically possible adjustment choices available to decision makers. The acceptance of one adjustment (flood insurance) has ramifications affecting choice and selection of other adjustments. An exploration of these ramifications concludes this report.

Data presented in the tables of this report was gained by processing, cross-tabulating and analyzing replies to the mail questionnaire. The raw data is found in Appendix D. Appendix D is separated into three groups: The first group presents the replies from everyone who responded to the questionnaire. The second group refers to only those households that stated that they were still living at the "same place" six months after the flood. The third group are those of group two who were living in the redevelopment project area six months after the flood.

#### Human Use System

Man sites his communities to gain what is productive from its location in the environment. Too often the site he chooses may also contain destructive possibilities. A description of a use system

therefore requires both an understanding of the rationale for initial development in a hazardous area as well as a description of the present use characteristics.

### Early Development

Lewistown is situated at the confluence of the Juniata River and Kishacoquillas Creek in central Pennsylvania. (Figure 4) This site was once a Shawnee Indian village, Ohessian. The Shawnee thwarted early European attempts to settle this site. By 1789, however, the area was secured and permanent settlement became possible.<sup>20</sup>

The discovery of limonite and the availability of hardwoods for charcoal signaled the beginning of the industrial development of the region. Several blast furnaces and iron forges were in operation at the opening of the 19th century. The completion of the Juniata division of the Pennsylvania Canal in 1829 enabled Lewistown to become the transportation (tourist and cargo) center for the surrounding area.<sup>21</sup>

Twenty years after the completion of the canal, Lewistown was connected to larger metropolitan centers by railroad. This transportation link enabled this area of Pennsylvania to maintain its early economic advantage in the iron industry even though its raw materials were becoming scarce. They could economically import raw materials and export forged products owing to the low rail freight rates.

With the availability of an adequate supply of quality water as an incentive, textile mills began to locate in the area. The first,

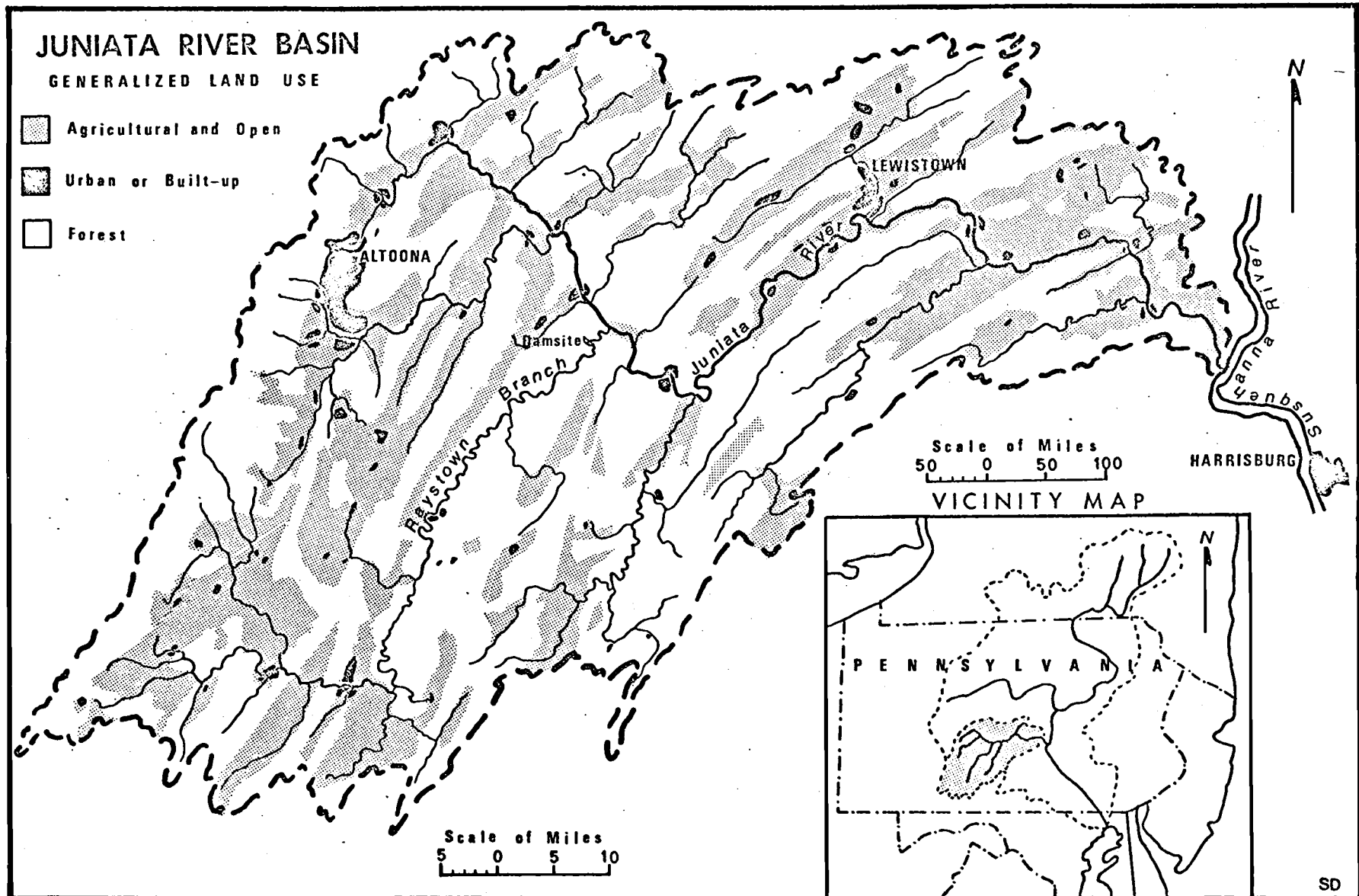


Figure 4

the Susquehanna Silk Mill, located in 1890. The American Viscose Company followed in 1919.

The appearance of these textile mills and other new industrial activities induced an impressive increase in the town's population. (Table 3) The larger spurts in growth occurred in the decades between 1900 - 1910 and 1920 - 1930. This rapid expansion created a serious housing shortage in the community.

TABLE 3 - POPULATION CHANGE - LEWISTOWN, PENNSYLVANIA

Year	Population	CHANGE FROM PRECEDING CENSUS	
		Number	Percentage
1900	4,451		
1910	8,166	3,715	83.5
1920	9,849	1,683	20.6
1930	13,357	3,508	35.6
1940	13,017	-340	-2.5
1950	13,894	877	6.7
1960	12,640	-1,254	-9.0
1970	11,098	-1,542	-12.2

Source: U. S. Census, U. S. Department of Commerce.

#### Residential Development of the Flood Plain

After the first World War a campaign was organized by Lewistown businessmen to entice new industry into the community. They were successful in attracting the American Viscose Company, a manufacturer of rayon yarn. This company built a mill and processing plant that eventually employed 2,000 people. To ameliorate the pressure on the housing market that would be caused by its arrival, the company built

a "model industrial village" on the hillside above the mill. But, even with this new village the housing shortage persisted.

Rising in response to this demand for new housing (and the availability of new wages) was the Lewistown Housing and Development Corporation, formed in 1920. In efforts to raise capital to build the needed housing, the corporation sold shares at rallies and public meetings. The corporation was underway when \$8,000 had been pledged by local citizens and \$72,000 had been provided by the members of the corporation.<sup>23</sup> This difference in support indicates that the individual members of the housing corporation had a considerable financial interest in the housing program.

The decision was made to locate most of the new housing on the flat south side of Lewistown. (Figure 2) This area had a known flood history having been twice flooded in the thirty-year period prior to the start of the housing program.

In 1889 flood water rose fifty feet above normal, inundating the entire south side of Lewistown.<sup>24</sup> The storm associated with this flood was also responsible for the famous Johnstown flood. Five years later, in 1894, flood water again rose over the south side of town, this time to a level ten feet below the previous flood.<sup>25</sup> (Figure 3A)

With this history of flooding in living memory, the decision by the members of the housing corporation to permit construction in this obviously hazardous location was irresponsible. A weak support for their decision can be maintained by arguing that ignorance of the causes of flooding or a belief that the really big flood had occurred



and would not return for a long time is sufficient reason to excuse their decision where to build. More than likely, however, the rationale for development in this flood prone area stems from the simple desire to meet the need for new housing, the availability of the land, plus euphoria associated with the local economic boom and a wish to "turn a profit." Nevertheless, some combination of factors must have reduced the perceived flood risk associated with the area enough to permit development.

During the years between 1923 and 1930, more than 600 homes were constructed under the authority of the Lewistown Housing and Development Corporation. When completed these homes were offered for sale at a price around \$3,000 each.<sup>26</sup> Unfortunately, the new homeowners had only to wait until 1936 for their first experience with flooding.

The Corps of Engineers estimated that the 1936 flood caused 18 million dollars worth of damage in Lewistown. Of this damage, they also estimated that 75% was sustained by the American Viscose Company.<sup>27</sup>

#### The Study Area in June 1972

In the spring of 1972 there were 856 households listed in the City Directory of Lewistown, Pennsylvania as having addresses in the study area. (Figure 2)

Residential Structures in the Study Area. Prior to the June 1972 flood the average household in the study area was living in a two or more story (with basement) wood frame house

built before 1940. (Table 4) The impact of the housing development program can be clearly seen. Forty percent of the homes in the area are wood frame two story structures built between 1920 and 1940.

TABLE 4 - THE LEWISTOWN, PENNSYLVANIA STUDY AREA:  
HOUSE TYPES AND DATE OF CONSTRUCTION

Year Constructed	Before 1920		1920 - 1940		After 1940		Totals	
House Types	Wood Frame	Brick, Other	Wood Frame	Brick, Other	Wood Frame	Brick, Other	Wood Frame	Brick, Other
One story	1	1	2	1	0	1	3	3
One story, basement	2	3	2	1	2	1	6	5
Two or more stories	2	2	0	0	0	0	2	2
Two or more stories, basement	22	12	51	10	4	5	77	27
Totals	27	18	55	12	6	7	88	37
							N = 125	

Source: Compiled by author from survey results.

One other item of interest is the proportion of homes built of brick, stone, or cinder materials. This proportion varies during each time period considered. Of those built before 1920, 40% were of brick, stone and cinder block. Between 1920 and 1940 the percentage

of homes constructed of these materials dropped to 17%. In more recent times, since 1940, the percentage of wood frame about equals that of brick, stone and cinder block.

During the home construction boom, most of the homes constructed in the study area were built of materials highly susceptible to flood damage. In addition, most have basements that probably serve as utility areas. The preponderance of multi-story structures provided a storage area for personal property and a refuge during and after flooding. The presence of an upstream reservoir did not seem to stimulate more intensive residential use of the study area. This may be due, in part, to the fact that the reservoir was still under construction. Perhaps an inauguration ceremony announcing the completion of the dam was necessary to spurt new developments.

An important reason to explain the lack of any significant increase in the number of homes built in the study area during this time is indicated by the population changes that have occurred in the community. With the exception of the decade during the Second World War, the community has been losing population at an increasing rate. (Figure 3) For instance, between 1960 and 1970 the population declined by 12.2%. A community experiencing this dramatic decrease in population is not likely to be experiencing new residential developments within its borders.

An exception is found in the new public housing units that were built since the late 1960's. Two of these units are in the study area. (Figure 2 - located north of the Lewistown Regional Recreation Park)

Households in the Study Area. The 856 households of the study area were living in homes under different conditions of tenure, (Table 5) The difference in tenure seems to be dependent upon flood zones. In zone A only 55% of the households own their homes. In zone B this figure rises to 70% but in zone C it drops to 45%. For the study area as a whole the percentage of homeowners is 60%.

TABLE 5 - THE LEWISTOWN, PENNSYLVANIA STUDY AREA:  
HOME TENURE AND LENGTH OF RESIDENCE BY  
FLOOD ZONE

Length of Residence (Years)	Flood Zone*							
	A		B		C		Totals	
	Owner	Renter	Owner	Renter	Owner	Renter	Owner	Renter
5	0	5	16	10	2	10	18	25
6-10	1	1	10	6	0	4	11	11
11-20	2	2	15	9	7	1	24	12
21-30	1	2	9	0	5	2	15	4
30	2	1	13	3	1	1	16	5
Total	6	11	63	28	15	18	84	57
								N = 141

\*See Figure 2 for the location of these zones.

Source: Compiled by author from survey results.

Home tenure is clearly associated with length of residence. Specifically, those that have lived in the area the longest tend to own their own homes.

Over seventy percent of the households in the study area have lived at their pre-flood addresses for less than 20 years. This means that the June 1972 flood was their first experience with

flooding; at least at that particular property. A dark line separates Table 5 into two groups. The group represented below the line has lived at their residence in the study area long enough to have been previously flooded at least once (1936). The group in flood zone A may have experienced flooding twice (1950 and 1936).

In a flood emergency, flood veterans provide a reservoir of practical and experiential information of use to households hastily developing strategies in order to deal with the hazard. Decisions concerning what property to elevate, what to remove, how to behave, where to go are clarified if the reasoned opinion of someone who has experienced the same problem can be obtained. But owing to the small number of households that had flood experience, most of the newer households in the study area had to rely on radio broadcasts for technical information and advice.

The average household in the study area contained 3 people. The population of the area prior to the flood is estimated to be 2,458 persons, with a zonal distribution of: A = 129, B = 1,790, C = 539. (Table 6) Although the average age of the head of a household is estimated to be 48 years of age, 30% of these persons are older than 65 years. In this group of older persons 52% are living alone.

Many of the emergency activities that are undertaken once a flood warning has been given and before the flood waters inundate a property are performed by members of individual households. Elderly persons living alone or as couples form a large segment of the population. Assistance by members of other households would be required by this population segment. This assistance must initially

come from neighbors who, while providing assistance, are neglecting their own property.

Households for a variety of reasons originally decided to live at their home in the study area. The reason most cited in the questionnaire was that the residence "was available for sale or rent at the time needed." Locational factors (proximity) was the second most popular.

Most (60%) of those households moved into their new homes with some knowledge of the flood hazard. (Table 7) The largest group that reported that they were unaware of the flood danger were living in the most hazardous zone for less than five years (83%). The largest percentage difference in awareness falls in the group recently occupying the study area (52%).

TABLE 6 - THE LEWISTOWN, PENNSYLVANIA STUDY AREA:  
AGE OF THE HEAD OF HOUSEHOLD AND HOUSE-  
HOLD SIZE

Age of House- hold head (years)	Household Size							Totals
	1	2	3	4	5	6	7	
21-25		0	5	1				6
26-30	1	1	1	2	3			8
31-35	1	0	5	6		1	1	14
36-40	0	0	1	3	3	1		8
41-45	1	1	2	4		1	1	10
46-50	0	2	5	3	2			12
51-55	1	4	2	4				11
56-60	2	4	5	1	1	3		16
61-65	5	3	2	2				12
Over 65	21	11	4	4				40
Totals	32	26	32	30	9	6	2	137

Head of Household Average Age = 48 years old  
Average Household Size = 2.88  
Estimated number of study area residents = 2,468; Zones A = 129,  
B = 1,790, C = 539.

Source: Compiled by author from survey results.

The group of households most aware of the flood danger moved into their homes in the years immediately following the flood of 1936 or 1950.

TABLE 7 - THE LEWISTOWN, PENNSYLVANIA STUDY AREA:  
PERCENTAGE OF HOUSEHOLDS WITH NO PRIOR  
KNOWLEDGE OF FLOOD DANGER BY LENGTH OF  
RESIDENCE AND RESIDENCE LOCATION (FLOOD ZONE)

FLOOD ZONES*												
Length of Residence (Years)	A			B:			C			Totals		
	Yes	No	% No	Prior Knowledge of Flood Hazard						Yes	No	% No
	Yes	No	% No	Yes	No	% No	Yes	No	% No	Yes	No	% No
5 or less	1	5	83	16	9	36	3	8	72	20	22	52
6-10	3	0	0	8	6	43	2	2	50	13	8	38
11-20	3	1	25	14	7	33	6	2	25	23	10	30
21-30	2	1	33	8	1	11	3	2	40	13	4	24
more than 30	2	1	33	10	6	37	2	0	0	14	7	33
Totals	11	8	42	56	29	34	16	14	46	83	51	37
*See figure 2 for the location of these zones.											N = 141	

Source: Compiled by author from survey results.

In summary, the residential human use system of the study area contained more than 800 households; the majority of which were homeowners that had lived less than 20 years in multi-story wood frame houses that were constructed before 1940. The average household contained three persons. Most households decided to locate in the study area because the property was available when needed. They moved in with knowledge of a flood hazard but without any past flood experience.

### The Natural Events System

Lewistown is located at the lower end of the Juniata River Basin in central Pennsylvania. (Figure 4) The drainage system in the basin consists of subsequent and consequent streams arranged in a trellis pattern. This pattern outlines the ridge and valley topography of the basin.

#### Topography

The ridge system in the basin is part of the "Appalachian Mountains" that extend from Pennsylvania to Alabama.<sup>28</sup> The several parallel ridges in the basin form a long sweeping curve, extending in a general northeast to southwest direction. The elevation of the ridges is primarily between 1,500 and 2,500 feet, with higher ridges located in the western portion. The western perimeter of the basin is determined by the excarpment of the Allegheny front.

The ridges of the basin are not rugged enough to produce a true mountain climate, but they do influence air movements and daily temperatures. The ridges also deflect general storm winds, while summer showers and thunderstorms are often shunted up the valleys.<sup>29</sup>

#### Forest Cover

An estimated 60-79% of the basin is covered with Oak-Hickory and Maple-Beech-Birch forest types.<sup>30</sup> Forests occupy the mountain slopes and crests, agricultural and urban activities are found in the valleys near the water courses. The forest cover provides the "maximum



opportunity" for controlling run-off by allowing interception, infiltration and soil moisture storage.<sup>31</sup> But the steep slopes of the ridges cause rapid surface and subsurface flow in channels. If the precipitation occurs as rainfall in the spring or fall, the forest cover is less able to retard run-off because by then deciduous trees have shed their leaves. This problem is offset somewhat due to most precipitation falling in these seasons as snow.<sup>32</sup>

### Past Floods

Damage inducing floods in the Juniata basin are random events. (Figure 3A) Their magnitude depends upon the storm system and the condition of the basin at the time. A potentially damaging storm can have its effect diminished or increased by the presence or absence of snow or frozen ground. Snow did influence the impact of the flood producing storms of 1936 and 1950.

In March 1936 two extraordinary frontal storms passed over the Juniata Basin. By pulling moist air into the system from the Atlantic Ocean these storms produced extraordinary amounts of precipitation. This rain fell on snow covered ground and melted it sufficiently enough to add the equivalent of two additional inches of rainfall.<sup>33</sup>

Circumstances were different with the November 1950 flood producing storm. This time, when a low pressure cell that was moving up the Atlantic coast moved inland, it met colder air resulting in the precipitation near the end of the storm falling as snow.<sup>34</sup>

### Hurricane and Tropical Storm Agnes

Hurricane Agnes. The first tropical depression of the new year began off the Yucatan coast on June 15, 1972. It was named Agnes and kept under close surveillance. The storm intensified to hurricane proportions and was reported moving slowly northward two days later. The storm moved inland over Florida on the evening of the 19th and followed a path northward through coastal states for the next three days. (Figure 5)

Tropical Storm Agnes. After moving inland wind velocity had decreased enough to reclassify Agnes as a Tropical storm. By Friday the 23rd, the storm center had moved southwestward enough to be absorbed by a broad, deep extratropical low pressure system in central Pennsylvania. This system remained in this general area for the next two days. Eventually, it moved northwestward, then northeastward across Maine, and out over the Atlantic Ocean.

In the Juniata Basin rainfall from Agnes fell on ground wet from previous storms, resulting in extensive runoff. Torrential rains began in the basin of the 21st and continued for roughly 48 hours. Total rainfall in the basin ranged from approximately 5 to 13 inches. (Figure 6) The largest amounts of rainfall fell down basin from Lewistown.

The most intense center of precipitation was located east of the Juniata Basin in the Great Valley of Pennsylvania. The ridge system of the Appalachian Mountains influenced the distribution of the rainfall by acting as orographic barriers to the westward moving marine air being pulled into the low pressure system.

Small streams in the basin began flooding on the 21st responding to the storm and heavy runoff. By the 23rd the Juniata River and all

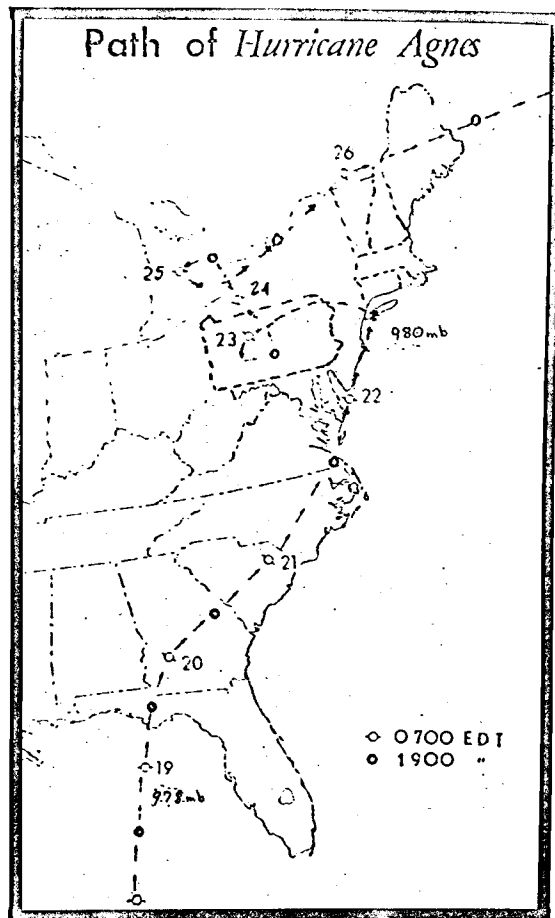


Figure 5 Source: Weatherwise, Vol. 25, no. 4, (August 1972) p. 174.

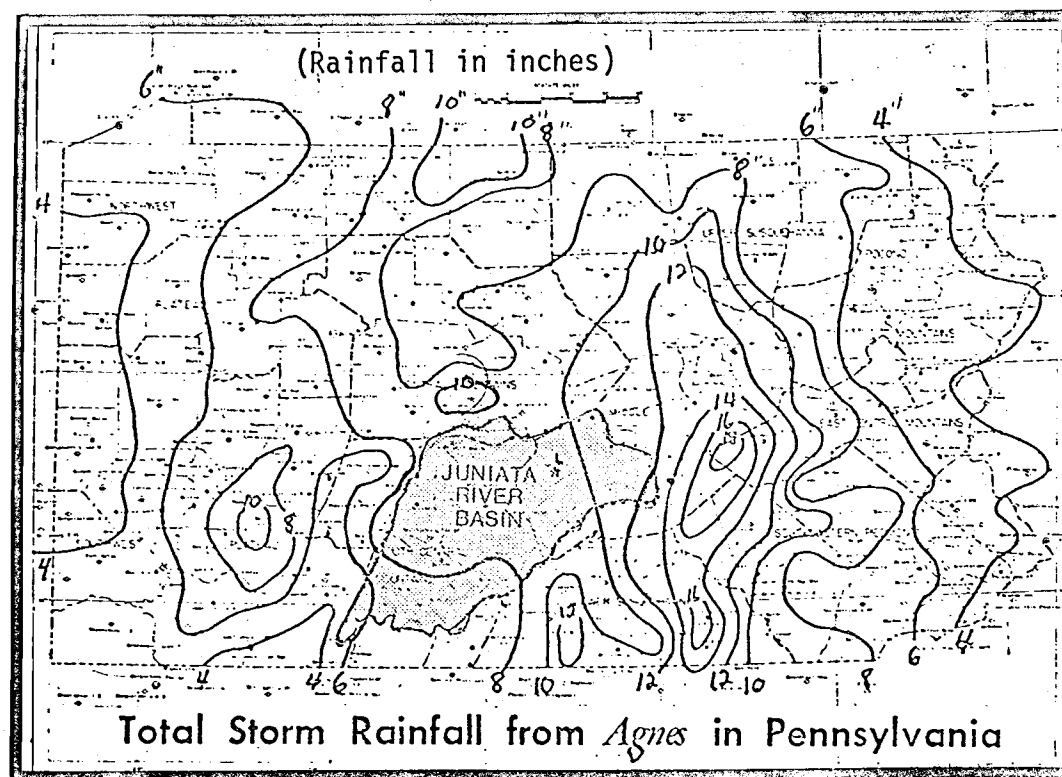


Figure 6 Source: Weatherwise, Vol. 25, no. 4 (August 1972), p. 181.

tributaries were flooding. The Juniata crested at Lewistown at 6:00 P.M. on the 23rd, 19 feet above flood stage. (Figure 3D) The 486.1 foot flood crest level was maintained for three hours before the flood began to subside. Twenty-four hours later the flood had passed.

In summary, floods of the natural event system in the Juniata Basin are extreme hydrometeorological phenomena. The magnitude, speed of onset, duration and possible frequency of these events are subject to many complex factors. The peculiarities of each storm determine the distribution (spatial and temporal), intensity, kind and amount of precipitation. Runoff depends upon the availability and integrity of storage (surface and subsurface). The timing of runoff is influenced by the morphometry, topography, and land-use of the basin. The actual physical impact of the flood is due to the volume, velocity, kinds of transported substances, surficial extent and duration of water in extra-channel (flood plain) storage.

### The Natural Events Adjustments System

#### Early Suggestions

Soon after the 1936 flood, efforts were commenced to have the flood control possibilities of the Juniata Basin investigated. An early suggestion by the Corps of Engineers outlined a flood protection scheme for Lewistown that consisted of a series of levees and floodwalls with pumps.<sup>35</sup> At a meeting in 1948 the Corps reported that this type of local works for Lewistown was not economical; instead, they

recommended that a dam be constructed near the mouth of the Raystown Branch of the Juniata River.<sup>36</sup> (Figure 4)

#### Raystown Dam and Reservoir

Congress authorized the Corps to study the flood control potential of the Juniata Basin in 1944 and again in 1954. The plan for the Raystown Dam was submitted to Congress in 1962.<sup>37</sup> Funding to begin construction of this project was appropriated in 1968 with project completion scheduled for 1974.<sup>38</sup>

The Raystown Dam and reservoir was initially designed as a flood control and power generation multi-purpose water resource project. By the time of actual construction, the design had been changed. Reservoir capacity was reduced from 820,000 acre-feet to 762,000 acre feet with storage allocated about equally to flood control, recreation and water quality.<sup>39</sup>

Although still under construction when Agnes struck, the Raystown dam was able to store 160,000 acre-feet of flood water. This amount of storage was enough to reduce the flood peak at Lewistown by 7.5 feet.<sup>40</sup>

#### The 100 Year Flood Level

After the Agnes flood, the Corps of Engineers recalculated the 100-year flood level for Lewistown. Before the Raystown Dam was constructed, the 100-year level was estimated to be at 482.7 feet. (Figure 3C) With the dam in place this level was reduced to 476.5 feet, a decrease of 6.2 feet. When the data from Agnes was included in the calculation, the 100-year level was raised 8.5 feet to 485.0 feet.<sup>41</sup>

The impact of the Agnes data on the 100-year flood level calculation illustrates the effect both an unprecedented storm and a short period of streamflow record for the basin (less than 100 years) can have on the statistical determination of the frequency of rare natural events.

Another partially completed water resource project, the Lewistown Water Supply Reservoir, was able to store flood water. This reservoir is located in the mountains west of Lewistown on Laurel Creek, a tributary of Kishacoquillas Creek. As with the Raystown Dam, when Agnes occurred, this structure had not been tested as a water storage facility.

#### Adjustments After Agnes

Several efforts were made after Agnes to estimate the feasibility of constructing other flood control projects in the basin. A Soil Conservation Service Study was undertaken of the Kishacoquillas Watershed. An official of SCS reported that flood control on Kishacoquillas Creek would have little effect on the flood problems of Lewistown.<sup>42</sup>

In summary, the major adjustment in the natural events system (the Raystown Dam and Reservoir) was able to reduce the flood peak at Lewistown in June 1972 (Tropical Storm Agnes), but it was not able to prevent substantial flood damage. Additional structural works for flood control in the basin seem unlikely if the thirty years (or more) lag from the inception of the Raystown Project to its completion indicate the relative importance at the Federal level of the basin and Lewistown as its major damage center.

### The Natural Hazard System

A Natural Hazard results from the unique junction of a particular use system with a particular hazard event. The effect of one junction, the study area of Lewistown, Pennsylvania and the flood from Tropical Storm Agnes, is represented by three stage-damage curves. (Figure 3F) The curves were determined by calculating the total and average damage for each flood zone by tenure. (Table 8) The estimate of the total flood damage for each zone was located at the upper stage limit of that zone. Curves were then drawn through these points.

The questionnaire responses represent a good assessment of the total flood damage experienced because most households in the study area applied for emergency loans. In order to receive a loan, a list itemizing flood damaged property had to be prepared with the assistance of a qualified contractor. This list is then reviewed and adjusted by a loan clerk. From these actions it can be assumed that a household has a reasonably good idea of the damages caused by the flood. It could also be speculated that the value indicated on the questionnaire expressed what each household subjectively estimated as the flood damage experienced. This value could mark a reference point for decision making.

The amount of damage caused by the flood is less than the potential damage, because the many households who undertook emergency adjustments (elevation or removal evacuation of property).

The collection of data in arbitrary intervals has limited the precision of these damage statistics. The desire to have a facile questionnaire warranted offering few intervals. In retrospect, each

TABLE 8 - THE LEWISTOWN, PENNSYLVANIA STUDY AREA: REPORTED  
FLOOD DAMAGE AND ESTIMATED TOTAL FLOOD DAMAGE

Flood Zone And Tenure		Reported Flood Damage						Total Reported Flood Damage	Average Reported Flood Damage	Estimated Reported Flood Damage
		\$ 0	\$ 250	\$1,500	\$ 3,500	\$ 7,500	\$12,500			
A	Own	0 (0)	0 (0)	0 (0)	0 (0)	37,500 (5)	25,000 (2)	62,500 (7)	8,928 (7)	232,128 (26)
	Rent	0 (0)	250 (1)	4,500 (3)	17,500 (5)	22,500 (3)	0 (0)	44,750 (12)	3,729 (12)	171,534 (46)
	Total	0 (0)	250 (1)	4,500 (3)	17,500 (5)	60,000 (8)	25,000 (2)	107,250 (19)	5,645 (19)	406,440 (72)
B	Own	0 (0)	250 (1)	3,000 (2)	42,000 (12)	322,500 (43)	62,500 (5)	430,250 (63)	6,829 (63)	2,820,377 (413)
	Rent	0 (4)	500 (2)	6,000 (4)	31,500 (9)	52,500 (7)	12,500 (1)	103,000 (27)	3,814 (27)	675,078 (177)
	Total	0 (4)	750 (3)	9,000 (6)	735,000 (21)	375,000 (50)	75,000 (6)	532,250 (90)	5,914 (90)	3,489,260 (590)
C	Own	0 (0)	500 (2)	1,500 (1)	35,000 (10)	15,000 (2)	12,500 (1)	64,500 (16)	4,031 (16)	391,031 (97)
	Rent	0 (3)	500 (2)	6,000 (4)	10,500 (3)	30,000 (4)	0 (0)	47,000 (16)	2,937 (16)	284,937 (97)
	Total	0 (3)	1,000 (4)	7,500 (5)	45,500 (13)	45,000 (6)	12,500 (1)	110,600 (32)	3,456 (32)	670,464 (194)
a. calculated from zone totals						Total Own		557,250 (86)	6,479 (86)	3,473,093 (536)
b. calculated from tenure/zone totals						Total Rent		194,750 (55)	3,540 (55)	1,133,090 (320)
Source: Compiled by author from survey results.						Study Area Total		752,000 (141)	5,333 (141)	a b4,565,333 4,506,183

Source: Compiled by author from survey results.



interval should have been narrowed, made uniform and more choices offered. The best procedure may have been to simply allow the respondent to write in the amount. Respondents could separate damage into categories, i.e. structure and household goods.

### Emergency Adjustments

Emergency adjustments to a natural disaster can be efficiently undertaken, providing sufficient and credible warning is given in time to permit effective mobilization of resources. This necessitates:

- 1) an early warning network that can rapidly collect, process and report environmental conditions in terms that enable effective action,
- 2) a series of mobilization schemes that range from one person to every person, and 3) effective, rapidly assembled post-disaster assistance and support systems.

### Flood Warning

The progress of Hurricane Agnes was followed by national television and local newspapers as it moved up the coast. Civil defense leaders in Pennsylvania were warned of the possibility of flooding on June 20. Residents of the lower lying area in the Juniata Basin were publicly warned on the 22nd that flooding would occur.

Flood warning announcements made by the River Forecast center in Harrisburg, Pennsylvania dramatically illustrate the manner in which the sequence of events was reported.<sup>43</sup>

4 PM EDT Wednesday June 21, 1972

Widespread small stream flooding is expected tonight throughout the Susquehanna Basin including the Juniata and west branch.

Many small streams are near bankfull and continued heavy rain expected tonight will cause much local flooding. Main channels of the Susquehanna and Juniata are well below flood levels, and no main stream flooding is expected at this time.

4 AM EDT Thursday June 22, 1972

Severe local flooding is occurring in the Harrisburg area at 4 A.M. Heavy rain is continuing and near disaster conditions are developing locally. Many families are being evacuated. Driving is hazardous and will continue so into the morning.

10:30 AM EDT Thursday June 22, 1972

Flood stages are forecast for all stations along the main stem of the Susquehanna River. Rainfall amounts range from 3 to 10 inches during the past 24 hours, and more rain is forecast for today. The Juniata River Basin is forecast to exceed flood stage throughout the entire reach of the Juniata River.

9:30 PM EDT Thursday June 22, 1972

A severe record breaking flood is in progress on the Susquehanna River near Harrisburg. Record or near record stages are being forecast through the entire Susquehanna River Valley.

8:00 AM EDT Friday June 23, 1972

Record flood stages have occurred, or are forecast for the Susquehanna River from New York southward. Harrisburg is forecast to crest near 32 feet later today. The river forecast center has lost power and is transferring to state civil defense headquarters in the Capitol.

### Elevation and Evacuation

The first flood adjustments were made previous to issuance of the official flood warning. Households in lower areas responding to small amounts of water in their basements began elevating movable objects. Within hours many of their neighbors in the study area would join them. Later when deeper water was evident, pumps were employed to empty cellars.

After the official flood warning had been announced, households began en masse to elevate or evacuate their personal property. Many residents later commented that they often made the choice concerning personal property to be protected from their own past flood experience. Those without this experience asked their neighbors.

At first private vehicles were employed to evacuate property and persons. As the flood became more eminent, National Guard Vehicles and trucks on loan from local shipping companies were used to transport and store household goods. These larger vehicles were driven loaded to safety and parked until the flood had passed.

In his recorded experiences of the event, a Lewistown newspaper reporter noted that he and many of his neighbors believed the new highway by-pass (built ca. 1965) would act as a levee.<sup>44</sup> (Figure 2) (See Appendix E for an abridgement of his report.) The common belief that a structure not designed for flood control would provide protection reduced the effectiveness of the evacuation activities. The highway by-pass, although not active as a levee, may have been responsible for reducing water velocities.

During the actual flood crises, evacuated households were housed with friends or in public shelters. Public and private relief organizations, as well as numerous citizens, donated food and bedding to aid flood victims. This was the period of the "Altruistic Community."<sup>45</sup>

A therapeutic social system developed in Lewistown during the disaster period. Barton describes this kind of system as one that:<sup>46</sup>

Helps to compensate for the sorrow and stress under which many members are living with an unexpected abundance of personal warmth and direct help. Information about the

needs of community members is widely shared, there is rapid consensus on actions to be taken to meet those needs, and highly motivated work for common purposes. These behavior patterns persist until the more urgent needs are met; then the perceived reduction of the urgency of needs of others, and the growing concern with neglected private interests, swing the system back toward normal self-oriented behavior.

After the flood waters receded, most families returned to their residences and lived on the second floor while repairing the damaged portions. Some households, however, returned to find their former residence either missing or unlivable. Many of these families sought temporary disaster housing.

#### Temporary Disaster Housing

The Disaster Relief Act of 1970 charged HUD with the responsibility of providing emergency disaster housing for families unable to return to their damaged homes. In Lewistown 152 families were housed in disaster housing. These housing units were provided with up to one year's free rent until the occupant could find permanent housing. Mobile homes and other rental units in the community were utilized.<sup>47</sup>

Many families were able to place these mobile homes near their flooded residence and they were able to live in the trailer as their homes were repaired.

#### Small Business Administration Disaster Loans (SBA)

Section 7 (b) of the Small Business Act, as amended, provides for loans to restore, as nearly as possible, the property of victims of natural disasters. Before Agnes struck \$2,500 of the amount of

the SBA loan could be forgiven after the first \$500 had been paid back. Interest rates on these loans were 5 1/8%.

In his message to congress proposing the Agnes Recovery Act, the President raised the forgiveness amount to \$5,000 applicable to the first dollar of the loan rather than after \$500 had been returned. The interest rate on the balance was lowered to 1%, payable in 30 years. Very liberal terms in an election year.

Four days after the flood, a Small Business Administration (SBA) office opened in the Lewistown area to provide disaster loans for flood victims. To qualify for a disaster loan, residents had to prepare a detailed listing of their property destroyed or damaged in the flood. This list included an estimate of the cost of replacement prepared by a reliable contractor, supplier or repairman. Households were instructed that these funds could not be used to upgrade the quality, size or capacity of their household goods.

A survey of the families living in the Temporary Disaster Housing disclosed that 59% of those households that applied for SBA loans actually received them. Those receiving a loan on the average received only 45% on the amount requested. Data from the study area suggests a different story.<sup>48</sup>

In the study area 89% of the households reported that they received a SBA loan. The discrepancy may reflect the greater proportion of homeowners (53-60%) in the study area than in the Disaster Housing Units (33% homeowners). The difference in reception between homeowners and renters is a function of damage sustained, homeowners suffered higher average damage. (Table 8)

In summary, elements in the emergency adjustment system were able to reduce flood damage. The rapid response by elements within the Exogenous Resource system through the provision of loans and shelter reduced the overall hazard effect. The rapidity and scale of support from this system may have influenced the acceptance of longer range flood adjustments.

### Hazard Effects

Russell, commenting on losses from natural hazards, asserts that tangible losses associated with flooding are a measure of the adequacy of adjustments to flooding.<sup>49</sup> The adjustments to flooding in Lewistown and the Juniata Basin did reduce losses substantially. The Raystown Reservoir reduced the potential flood level by seven feet. Property of unestimated value was evacuated or raised after the flood warning was given. SBA loans with a \$5,000 forgiveness clause reduced the "out-of-pocket" money households had to spend to replace, repair, or restore their property. Even with these adjustments, Agnes had a significant and immediate tangible impact on Lewistown.

### Recovery

Agnes also spawned a more pervasive and enduring problem. Owing to damage suffered in the flood, the American Viscose Division of the FMC Corporation prematurely reduced their scale of production. A spokesman for the corporation stated that the declining demand for continuous filament rayon yarn gave the plant a life span of five or six years at most before it would have to close.<sup>50</sup>

The plant closure left 2,000 workers without jobs. The unemployment rate in the Lewistown Labor Market jumped from 3.1% to 13.1% and became the largest in Pennsylvania. (Table 9)

TABLE 9 - THE EFFECT OF HURRICANE AGNES ON THE CIVILIAN  
WORK FORCE IN THE LEWISTOWN LABOR MARKET AREA

Employment Status	October 1971	October 1972	Change From	
			October 1971 Net	% Change
Total civilian work force	25,600	25,100	-500	- 2.0
Total employment	24,800	21,800	-3,000	-12.1
Total unemployment	800	3,300	2,500	312.5
Percent of civilian workforce	3.1%	13.1%		

Source: Pennsylvania State Employment Service.

The dramatic nature of the plant closure and the scale of its influence on the economy of Lewistown drew national attention.<sup>51</sup> Extensive recovery efforts (Project Recovery), financed by public and private funds, attempted to entice new industry into the community.

The campaign started with a series of advertisements. Ads depicting different types of workers now available were placed in business oriented magazines. The ads were captioned "Agnes fired us, but we won't quit." The ad continued to explain other advantages for locating in Lewistown; particularly, accessibility and scenic beauty.

The recovery project has borne fruit. A women's sportswear company began operation in November 1972. The possibility of this firm creating 300 new jobs has generated new hope in the Lewistown area.

In the fall of 1973 the Mifflin County Industrial Development Corporation announced that many new industries would be locating in the Viscose buildings. The enthusiasm and excitement generated by these developments obscured the comment that the new industries would be safe from future flooding since Raystown Dam would provide the necessary protection. A glance at the location of the Viscose buildings proves that this is a very dangerous assumption. (Figure 1) Clearly the buildings are within the 100-year flood plain (all the area flooded by Agnes is considered in the 100-year flood plain).

If community leadership encourages these new industries to employ flood-proofing measures and flood contingency plans, they can be welcomed by the community in good conscience.<sup>52</sup>

### Gains

It has been observed that sometimes a community struck by a disaster may have actually benefited from the disaster through the inflow of capital for rebuilding purposes.<sup>53</sup> Certainly in Lewistown the money loaned under the SBA program had an immediate impact on local businesses as households began replacing damaged property.

It is suspected that another type of gain occurs. This involves "Instant contractors" appearing to help households repair their residences. Surely most of these individuals operated honestly and forthrightly, but since contractors in Lewistown are not licensed, some profiteering may have taken place.



### Societal Strain-Social Stress

The disaster, with its initial shock of property loss and the after shock of the plant closure, induced a massive stress in the community's social system. The quick availability of disaster loans and severance pay for those forced out of work attenuated the overall negative impact.

The post-flood depression that occurred three months after the flood illustrates another phase of disaster recovery for the community. In order to help a publicity drive to draw new industry, residents, particularly those left jobless by the flood, were asked to show support and interest in the recovery effort by assembling in downtown Lewistown. At this time photographs for the official advertisement campaign were to be taken. The event was often heralded in the newspapers and on radio. Few people attended the ceremony. Dr. Michael Fishter, a psychiatrist, commented that it was too soon to expect victims of the flood and viscose closure to participate in any major rebuilding project.<sup>54</sup>

In summary, the effect of Tropical Storm Agnes extended far beyond flood damaged property and relief activities. The closure of the community's major employer coupled with the flood created a stress on the vital functioning units of the community. Although recovery efforts will alleviate much of the immediate and personal tension, and some of the loss, long range problems will remain. For Lewistown, the effect of Agnes had no rival.

### Adjustment Process Control

Hazard effects, if they exceed an action threshold, initiate a search for methods to alter the natural hazard or the hazard event by adjusting other systems: human use, natural event or emergency. There is a theoretical range of adjustment choices. (Table 10) This range as defined by White is "that number of adjustments and uses that have been practiced in any similar environment plus a possible innovation." <sup>55</sup>

The perception of the feasibility (practicality) of a choice may be blocked by the social guides of the individual resource manager's (Households) milieu. For example, a manager may be restrained from the implementation of a choice he considers practical by the social pressure of his community.

After the flood the households of the study area had available to them a theoretical range of choices. (Table 10) Each choice contained several elements that a decision maker weighs before the decision is made.

A managers estimate of the hazard may be favorable (+) or unfavorable (-) to the acceptance of a practical choice. Only if the managers perception of the hazard is unfavorable (-) for action will he decide to bear future flood losses; in other cases, he will chose another adjustment.

A manager may make his decision based exclusively on the criteria of gains and losses (Economic efficiency), accruing to future use of his property. In this case, bearing the losses would be perceived as unfavorable to choice.

TABLE 10 - THE THEORETICAL RANGE OF CHOICE OF ADJUSTMENTS TO FLOODING IN THE HUMAN USE SYSTEM OF THE LEWISTOWN, PENNSYLVANIA STUDY AREA

Theoretical Range of Adjustments	ELEMENTS IN CHOICE				
	Practical Range of Choice	Estimate of Hazard	Economic Efficiency	Spatial Linkage	Actual Choice
Bear losses	0	-	-	+	A
Emergency action (elevation, evacuation)	0	+	+	+	A
Public relief (Red Cross, etc.)	0	+	+	+	A
SBA loans	0	+	+	+	A
Move to new residence	0	+	+	+	A
Flood insurance	0	+	+	+	A
Land elevation	X	+	-	-	R
Structural change	(0)	+	+	+	(A)
Redevelopment project	(0)	+	+	+	(A)

0 - Open choice  
X - Blocked choice

(+) - Favorable choice  
(-) - Unfavorable choice

A - Accepted  
R - Rejected

( ) Possibly

Source: Modified from White, G. G., 1961. The Choice of Use in Resource Management. Natural Resources Journal, 1:23-40.

The third element of choice is the managers perception of the effect his actions might have on contiguous (flood plain) or functionally linked (residences) property uses. The land elevation would alter the physical appearance of the neighborhood and cause drainage water to collect on adjoining owner's property. It is therefore perceived as not conducive to action when this unfavorable spatial linkage happens.

With the exception of the elevation of property, all of the adjustments in the practical range of choices have been accepted in the study area. Structural changes made to reduce the impact of future flooding, and the Redevelopment Project (discussed later) are both considered possible, but their implementation has not been investigated.

#### Aggregate Adjustment Model (Figure 3)

The impact of a natural disaster can be evaluated by observing the level of adjustments to future similar events. Plotting the percentage acceptance of different adjustments by flood zones, produces a clear relationship among frequency of occurrence, flood damage and tenure. (Figure 3 - Aggregate adjustment decision model)

New Residences and HUD Trailers. (Figure 3, no.'s 1 and 2) The highest proportion of emigration originated in Zone A. Only 8% of the emigrant households were homeowners, many living in HUD trailers while repairing their homes. (Table 11)

Renters present a different situation. Nearly half (45%) of the households who were renting their dwellings before the flood were

TABLE 11 - THE LEWISTOWN, PENNSYLVANIA STUDY AREA: HOUSEHOLD RESIDENTIAL  
LOCATION SIX MONTHS AFTER THE FLOOD BY TENURE AND FLOOD DAMAGE

Location	No Damage		\$500		\$500-2,500		\$2501-5000		\$5000-10000		\$10,000		Totals	
	Own	Rent	Own	Rent	Own	Rent	Own	Rent	Own	Rent	Own	Rent	Own	Rent
Same Home	0	6	3	3	3	5	21	9	49	5	7	0	83	28
Percentage Same Home	0%	100%	100%	60%	100%	46%	100%	65%	96%	39%	100%	0%	97%	55%
New Residence														
Trailer	0	0	0	0	0	2	0	0	2	3	0	0	2	5
House	0	0	0	0	0	1	0	3	0	1	0	2	0	7
Apartment	0	0	0	2	0	2	0	2	0	3	0	0	0	9
Away from community	0	0	0	0	0	0	0	0	0	1	0	0	0	1
Other	0	0	0	0	0	1	0	0	0	0	0	0	0	1
Percentage New residence	0%	0%	0%	40%	0%	54%	0%	35%	4%	61%	0%	100%	3%	45%
Combined percentage of households living in new residences: 18%														
Totals	0	6	3	5	3	11	21	14	51	13	7	2	85	51

Source: Compiled by author from survey results.

living in different quarters six months after the flood. One-fourth of these households were in HUD trailers.

The percentage of renters that moved is a function of the damage they received. Only 40% of the renters who experienced less than \$500 reported flood damage moved. However, 66% of those suffering greater than \$500 damage moved.

Small Business Administration (SBA) Loans. Every household in the study area that had flood damages greater than \$2,500 reported the reception of an SBA loan. Only a small loan reception difference is apparent among the flood zones. (Figure 3, no. 3)

Flood Insurance. Three months after the flood the Borough Council of Lewistown applied for flood insurance. Within a month, Emergency flood insurance eligibility was approved by the Federal Insurance Administration of HUD. Insurance, under the emergency program, can be sold in a community before actual rates have been determined.

Rates. The maximum amount of coverage for a single family residential property is \$17,500 for structural coverage available at the subsidized rate of \$0.25 per \$100 of coverage. This represents a rate reduction from \$0.40 that was designed to encourage insurance purchases. The contents of a residence can be insured up to \$5,000 at a rate of \$0.35 per \$100. The minimum amount of purchase is \$25.00 for either type of insurance.

Agents. Flood insurance is sold by local, fire, casualty and property insurance agents. Twelve Lewistown area insurance agents,

whose advertisements in the Yellow Pages of the Telephone Directory indicated that they could sell flood insurance, were mailed a short questionnaire. When asked if they were advertising flood insurance, four of the five agents replied that they were using either radio or newspapers. Additional advertising for flood insurance did not represent a substantial extension in ongoing practices. Two of the five agents reported that they had contacted clients living in the flooded area about flood insurance. There has not been an active sales campaign in Lewistown by insurance agents due to low premiums and minimal compensation to the agent. Six months after the flood an insurance agent received a \$10 minimum for each policy sold.

A breakdown of the amount of flood insurance coverage sold by the agents replying to the questionnaire, indicated that households may insure themselves for amounts greater than the flood loss amount.

TABLE 12 - FLOOD INSURANCE SALES REPORTED BY INSURANCE AGENTS IN LEWISTOWN, PENNSYLVANIA

Amount of Coverage	Kind of Coverage	
	Structure	Contents
Less than or equal to \$5,000	1	151
\$5,000 - \$10,000	106	-
\$ More than \$10,000	71	-
Total	178	151

\* 40 more policies were sold, but were not separated by agent for use in table.

Source: Compiled by author from a questionnaire returned by five insurance agents in Lewistown, Pennsylvania.

Study Area. Flood insurance purchase in the study area demonstrated that the decision to purchase insurance is dependent upon flood damage experiences. (Table 13) Households with property damage less than \$5,000, but at least \$500, purchased flood insurance in 34% of the cases of those households with damage greater than \$5,000, 75% purchased flood insurance. Tenure also seems to influence flood insurance purchase. Three-fourths of all homeowners that experienced damage greater than \$5,000 purchased flood insurance. The investment difference in flood insurance is smallest between flood zones A and B (13%). These differences are minor when compared with zone C (A-C = 62% and B-C = 51%).

It appears that the holding of a mortgage may have had a small influence on a homeowner's decision to purchase flood insurance. (Table 13)

Redevelopment Households. Shortly after the flood the Mifflin County Redevelopment Authority received a grant to study the feasibility of extending their range of activity to include the lowest portions of the flood area, closest to Kishocoquillas Creek. (Figure 2) Seventy-five percent of the households in this area are in hazard zone B. The redevelopment project will be discussed in detail later in the Human Use Adjustment System (p. 75).

#### Managerial Decision Models (Flood Insurance)

Households made the decision to purchase Flood Insurance for a spectrum of reasons with the paramount reason being experienced flood damage. After reviewing the data gathered during the feasibility



TABLE 13 - THE LEWISTOWN, PENNSYLVANIA STUDY AREA: HOUSEHOLD  
PURCHASE OF FLOOD INSURANCE BY TENURE AND FLOOD DAMAGE

Flood Damage	Homeowner With:						Renter Of:						Percentage Purchasing
	No Mortgage			Mortgage			House			Apartment			
	Yes	No	%Yes	Yes	No	%Yes	Yes	No	%Yes	Yes	No	%Yes	
None	0	0	0%	0	0	0%	0	1	0%	0	5	0%	0%
Less than \$500	0	0	0%	0	1	0%	0	3	0%	0	0	0%	0%
\$500 - \$2,500	0	3	0%	0	0	0%	0	0	0%	2	3	40%	25%
\$2,500 - \$5,000	5	8	38%	2	6	25%	1	4	20%	3	3	50%	34%
-----													
\$5,000 - \$10,000	14	5	75%	24	5	83%	2	1	66%	1	2	33%	76%
More than \$10,000	3	1	75%	2	1	66%	0	0	0%	0	0	0%	71%
Totals	22	22	50%	28	13	68%	3	9	25%	6	13	32%	51%

Source: Compiled by author from survey results.

study for flood insurance, Czamanski concluded that:<sup>56</sup>

The age of a house, its value, the owners possession of a mortgage, the unpaid balance of the mortgage loan if the house is mortgaged, are, along with demographic characteristics as income, occupation, stage in life cycle, length of time lived at present location, important determinants of interest in flood insurance.

Many of these variables have been measured by the questionnaire responses from the Lewistown study area. When organized, as in a causal model, the influence of these variables on the flood insurance decision can be investigated by holding damage levels constant and measuring correlations between other variables and the insurance decision.

Causal models were developed to organize data from nonexperimental research activities, surveys. Through the use of partial correlation coefficients, those variables in the model which are unrelated would give predicted values of zero. The difference between predicted and actual values would be an indication of the adequacy of the model.<sup>57</sup>

In a situation when one is unable to use partial correlation coefficients with the data collected from a questionnaire, Davis offers an alternative.<sup>58</sup> He suggests dichotomizing the data as shown. (Figure 7)

		Variable Y		
		NOT Y	Y	
Variable X	X	Frequency A (Total cases X and NOT Y)	Frequency B (Total cases X and Y)	Marginal Frequency X (Total cases X)
	NOT X	Frequency C (Total cases NOT X and NOT Y)	Frequency D (Total cases NOT X and Y)	Marginal Frequency NOT (Total cases NOT X)
		Marginal Frequency (Total cases NOT Y)	Marginal Frequency Y (Total cases Y)	N (Total cases)

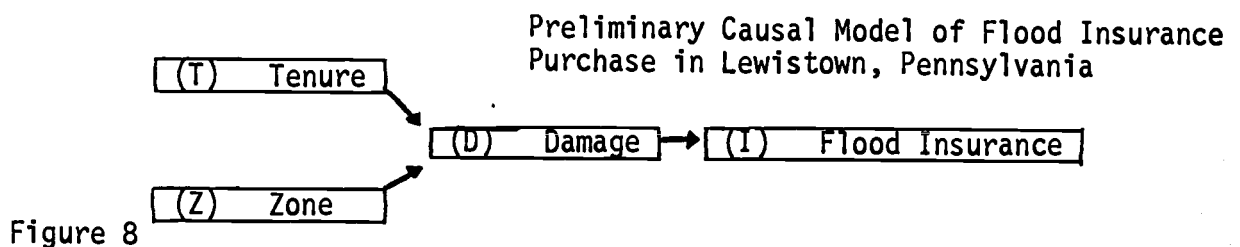
Figure 7: Nomenclature for a Four-Fold Table.

Yules Q, a correlation coefficient, is then used to determine the correlation between variable X and Y. The coefficient compares the consistent pairs (X and Y, NOT X and NOT Y) with inconsistent pairs (X and NOT Y, Y and NOT X). The formula is:

$$Q_{xy} = \frac{(B*C) - (A*D)}{(B*C) + (A*D)}$$

and values range from a perfect positive correlation of 1 to a perfect negative correlation of -1.

Yules Q can be used in the causal model because of the possibility of building more complex variables (pairs) and evaluating partial correlation coefficients while holding the other variables at constant levels. From the survey data of the study area the following preliminary model is suggested. (Figure 8)



In order to produce the raw data to evaluate the model Davis recommends dichotomizing as close to the 50-50 point as possible, and not wider than 70-30. Unfortunately with the survey data this is not possible in every case.<sup>59</sup> (Table 14)

The model states that property tenure and flood zone are both related to flood damage but not to each other. These variables are both correlated with flood insurance, but only by damage level. Flood insurance is seen as having no influence on other variables.

TABLE 14 - RAW DATA AND FOUR VARIABLE RESULTS:  
TENURE, FLOOD ZONE, FLOOD INSURANCE  
PURCHASE AND FLOOD DAMAGE

Tenure (T):	Homeowner (+) 72% (82), Renter (-) 28% (31)
Flood Zone (Z):	Zones A & B (+) 75% (86), Zone C (-) 25% (28)
Flood Damage (D):	More than \$5,000 (+) 54% (61), Less than \$5,000 (-) 46% (52)
Flood Insurance (I):	Purchased (+) 52% (59), Not purchased (-) 48% (54)

RAW DATA				
Tenure (T)	Flood Zone (Z)	Flood Damage (D)	Flood Insurance (I)	
			-	+
+	+	+	11	41
+	+	-	8	6
+	-	+	1	2
+	-	-	12	1
-	+	+	0	3
-	+	-	11	5
-	-	+	3	0
-	-	-	8	1

RESULTS						
Zero Order Correlation	Second Order Partial	Tenure Effect	Zone Effect	Damage Effect	Insurance Effect	Joint Effect
$Q_{DI} = 0.80$	0.69	0.09	0.19		-	0.09
$Q_{TI} = 0.58$	-0.03	-	0.46	0.73	-	0.41
$Q_{ZI} = 0.83$	0.59	0.19	-	0.35	-	0.30
.....						
$Q_{ZD} = 0.85$	0.76	-0.27	-	-	-0.10	-0.36
$Q_{TD} = 0.79$	0.72	-	-0.03	-	0.20	0.21
$Q_{ZT} = 0.44$	-0.16	-	-	0.92	0.57	0.57

Source: Calculated by author

Predictions for the model are:

1. A positive correlation between flood damage and the purchase of flood insurance,  $Q_{DI} = +$
2. A zero correlation between tenure and the purchase of flood insurance,  $Q_{TI} = 0$ .
3. A zero correlation between flood zone and the purchase of flood insurance,  $Q_{ZI} = 0$ .
4. A positive correlation between flood zone and flood damage,  $Q_{ZD} = +$ .
5. A positive correlation between tenure and flood damage,  $Q_{TD} = +$ .
6. A zero correlation between flood zone and tenure,  $Q_{ZT} = 0$ .

Analysis (Table 14, RESULTS)

With a high correlation between flood damage and insurance purchase ( $Q_{DI} = 0.80$ ), the large partial (0.69) and the joint effect of the other variables negligible (0.09), prediction one is supported. The moderate correlation between tenure and insurance purchase ( $Q_{TI} = 0.58$ ) is explained as the partial disappears (0.03), indicating that the correlation is caused by the other two variables, especially damage. Prediction two is supported. The high correlation between flood zone and insurance purchase ( $Q_{ZI} = 0.83$ ) is not reduced enough by the partial to support prediction three. Most of the joint effect results from flood damage which may originate from some physical feature of the flood zone, possibly building type. The very high correlation between flood zone and flood damage ( $Q_{ZD} = 0.85$ ) is unchanged by the partial and the moderate negative joint effect, thus

supporting prediction four. Prediction five is supported as the high correlation between tenure and flood damage ( $Q_{TD}=0.79$ ) remains unchanged by the partial. The low correlation between flood zone and tenure ( $Q_{ZT}=0.44$ ) almost disappears with the nearly negligible partial (0.16), indicating tentative support for prediction six.

The interaction of flood zone and insurance purchase ( $Q_{ZI}=0.83$ ) is the only unsupported prediction in the model. This may be caused by some structural differences in the zones or from the delineation of the zones based on street elevation. A better approach might be to use the flood frequency lines for the flood plain.

A more complete model is now suggested. (Figure 9) Testing of this model is difficult for some of the variables are rare events. Had the sample been larger, the response greater, or the proportions more nearly even the model could have been more fully evaluated. Nevertheless, it seems that the model represents, in the judgement of the researcher, the significant variables causally related to post-diluvial flood insurance purchase in the Lewistown study area.

Those variable found in the preliminary model are dichotomized in the same manner except for flood zone. In the complete causal model flood zone would be based on the flood frequency lines established by the U.S. Corps of Engineers for Lewistown. (Figure 11).

Flood Zone	Below 50 year flood level	(+), above 50 year (-) flood level
House Type	Two-story wood frame w/basement	(+), all other types (-)
Employment	Job unaffected to flood	(+), job loss related to (-) flood
Expected Length of Residence	more than 5 years	(+), less than 5 years (-)
Age of the Head of Household	55 years or older	(+), younger than 55 years (-)
Prior Flood Experience (Length of residence)	one or more (30 years or more)	(+), no prior experience (-) (less than 30 years)

CAUSAL MODEL OF FLOOD INSURANCE PURCHASE IN  
LEWISTOWN, PENNSYLVANIA

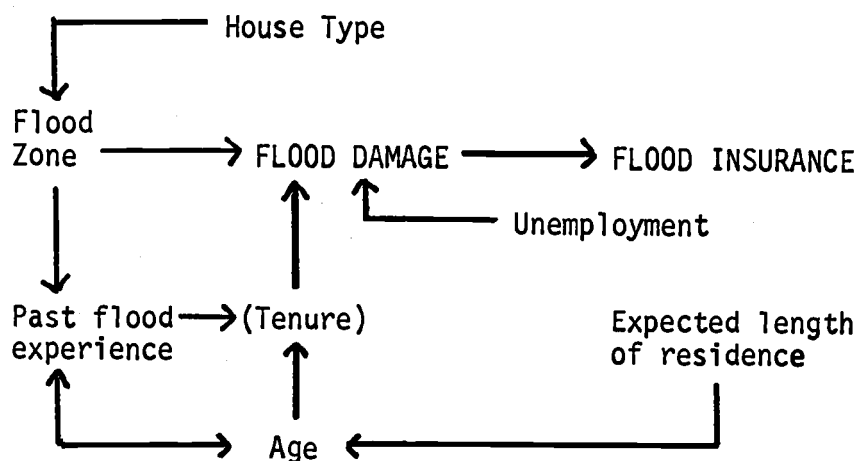


Figure 9

### Baysian Strategy

Individuals purchase insurance when they think the possibility of a serious loss exists even though its probability may be considered small.<sup>60</sup> With flood insurance available at subsidized rates (one-tenth the cost of actuarial for some cases) a rational person would purchase flood insurance even against very remote losses. For example, if the possibility of a \$10,000 loss from flood damage has a probability of occurrence of 1% in any year, the expected loss would be \$100 per year. With a premium rate of \$0.25/\$100 of coverage, \$10,000 of insurance costs \$25. Since the expected annual loss is greater than the annual insurance premium, the rational person would purchase flood insurance.

One view commonly forwarded in contemporary economic theory claims that a rational individual considers a large loss as not only more serious than that of a small one, but not simply to the extent as measured by the difference in dollar value between the losses but rather by the subjective values the individual ascribes to the difference in dollar values - his utility for money.<sup>61</sup> A person's utility value supposedly summarizes all psychological, economic and sociological factors in one net figure. If an individuals' utility curve shows sharply increasing marginal disutility for increasing losses the person considers large losses much more serious than twice the value of losses only half as large. (Table 14:  $U[-10,000] = 1,600$ ,  $U[-5,000] = 500$ )

In Table 14 the values from a utility curve of a representative but hypothetical homeowner in Zone B of the study area and the probability



assigned to each loss by the individual are used to determine if insurance should be purchased. Throughout the entire range of values an individual should purchase flood insurance since the utility loss of premium (-.15) is less than the expected damage.

TABLE 15 - UTILITY, PROBABILITY, EXPECTED  
VALUE OF LOSS AND UTILITY LOSS  
OF FLOOD INSURANCE PREMIUM FOR  
A HYPOTHETICAL HOMEOWNER

Dollar Loss If Flooded (1)	Utility Of Loss (2)	Probability Of Loss (3)	Expected Value Of Loss (2) x (3)	Premium @ \$0.25 /\$100	Utility Loss Of Premium
-10,000	1,600	0.01	-16	\$25.00	-0.15
- 5,000	500	0.05	-25	\$25.00	-0.15
- 1,000	80	0.20	-16	\$25.00	-0.15
- 500	20	0.40	- 8	\$25.00	-0.15
- 100	2	0.60	- 1.2	\$25.00	-0.15

Source: Adapted from Greene, Risk and Insurance, 1968.

Property owners in Lewistown purchased Flood Insurance if they received substantial damage from Tropical Storm Agnes. (Table 13) On the other hand, households receiving less than \$5,000 in damage had their decision influenced by the rapid availability and liberal terms of SBA loans, particularly the forgiveness amount. With \$5,000

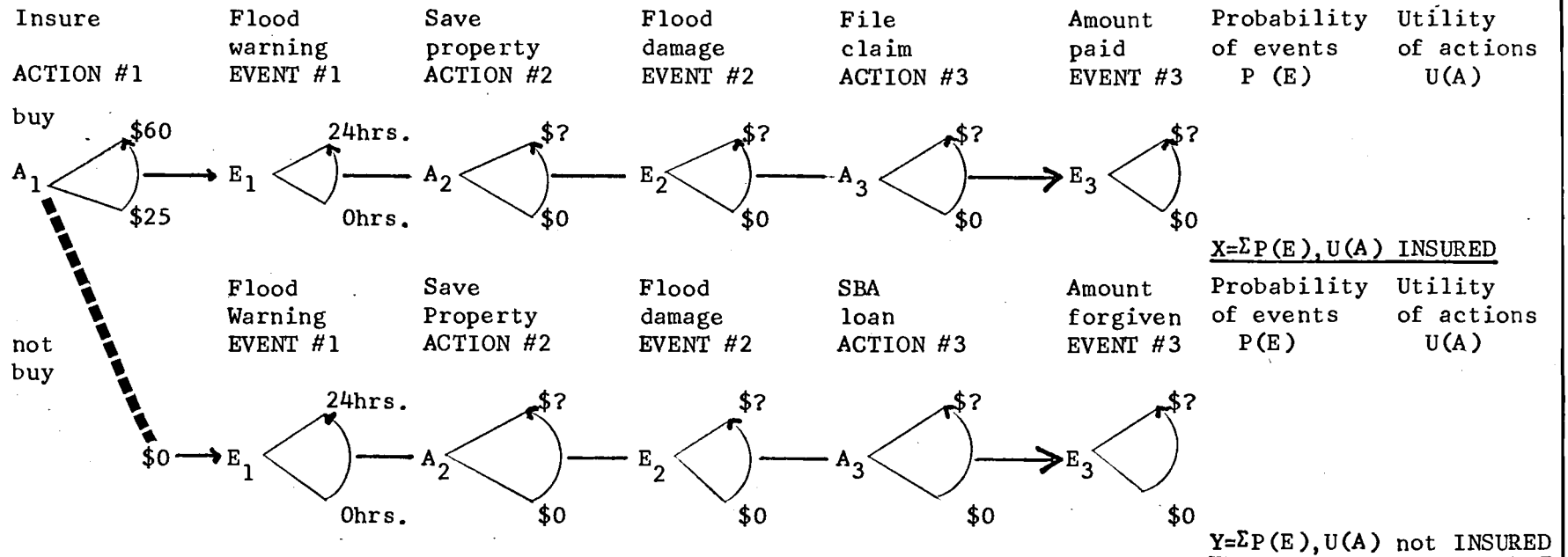
as a forgiveness feature, many households experienced little net loss as a result of the flood.

The flood insurance decision for individuals with losses less than \$5,000 may be viewed as a series of action and events, some of which are contingent upon each other. (Figure 10) An individual would decide to purchase insurance if the maximum probable utility of gain with insurance is greater than the maximum probable loss without it,  $x > y$ . In Lewistown the decision may have also been influenced by the expectation of receiving a flood warning in enough time to save damagable property,  $A_2 = f(E_1)$ . However, an insured individual may not strive as hard to save his property; so that  $A_2 = f(E_1 | A_1)$ .

The amount of flood damage received depends upon the characteristic of the flood event: velocity, load, duration, speed of onset. The perceived loss could be considered as a function of the efficiency of emergency measures contingent upon the length of flood warning,  $E_2 = f(A_2 | E_1)$ . The size of the insurance claim filed depends upon the amount of damage and an anticipation of the amount that might be paid by the insurance company ( $E_3$ ), so that  $A_3 = f(E_2, E_3)$ . An uninsured individual would apply for an SBA disaster loan (assuming that they are available). The amount of loan requested would depend upon the flood damage and the anticipated forgiveness amount ( $E_3$ ), so that  $A_3 = f(E_2, E_3)$ . (Figure 10) Any attempt to determine the prior and conditional probabilities of these events should be considered a formidable task for a property owner, requiring some form of technical assistance.

Cypra has observed that flood plain property owners are receptive to technical services (both information and advice).<sup>62</sup> Publication and

# A MODEL OF THE DECISION TO PURCHASE FLOOD INSURANCE IN LEWISTOWN, PENNSYLVANIA



Decision Rule: If  $X - Y \geq 1$ , buy Flood Insurance.

Figure 10

distribution of flood hazard maps with frequency boundaries (commonly 20-, 50-, 100-year floods) do enable a manager to better predict the probabilities at his own property. (Table 14) There is, however, considerable uncertainty in the mapping of flood hazards.<sup>63</sup> Much of this uncertainty can be attributed to the particular probability distribution assigned to the phenomena. Hewitt has summarized the difficulties with extreme value statistics by saying:<sup>64</sup>

A vexing question in extreme value statistics is the sense in which it is impossible to win by honest means. As usual, estimation of parameters of a distribution requires a sufficiently large and representative sample while the sample must be statistically homogeneous. For extreme events these two requirements tend to be self-defeating. Given enough time, even the most conservative properties of the earth or universe change. Without a longish period of time we cannot obtain an adequate sample. The same reasoning applies if we cast our net widely in a spatial sense.

There are two possibilities. If we can discover the overall or initial distribution in which the extreme values arise, then we can determine their probabilities directly from the structure of the distribution. Generally, investigators have found they cannot define the initial distribution. We then consider the ways extreme values can behave whatever the initial distribution, the "distribution free" approach. The two approaches are not mutually exclusive. Extreme value behavior of known distributions must fit one of the models developed by the second approach.

An additional method to determine the expected values (Table 14) would be some probabilistic predictor of the accuracy of the probabilities assigned to each of the flood damage events. With such a predictor, a Bayesian strategy could be derived. A Bayesian strategy considers what an individual believes (his subjective prior probabilities), what

he knows (the posterior probabilities) and what he wants (his utility function).<sup>65</sup> Halter claims that Bayesian strategies have three advantages: 1) They contain all admissible strategies corresponding to all sets of prior probabilities, 2) The strategy can always be a pure strategy, and 3) The Bayesian strategy can be relatively easy to compute.<sup>66</sup>

The advantages of developing a Bayesian strategy to assist floodplain managers considering flood insurance prompted a search for a suitable technique to predict on a yearly basis the likelihood of various flood events. None was found. Assumptions that variations in stream records might be a possible means of prediction was unfruitful. It appears; therefore, that a Bayesian strategy for flood insurance decisions may not be possible.

Studies of the use of utility functions in insurance purchases have disclosed that individuals do not purchase insurance to maximize their utility. Murray found that the utility function has little external validity when used to predict insurance choices.<sup>67</sup> Neter and Williams determined that the expected utility method was the least acceptable of those presented to subject experimentally.<sup>68</sup> A disagreement on their methodology did not change their evaluation.<sup>69</sup>

As an additional thought, Adams has observed that individuals perform as risk manipulators in hazardous or uncertain situations. The individual appears to behave not as a risk taker, but as a rationalizer engaging in perceptual distortion of environmental information for the purposes of reducing cognitive dissonance.<sup>70</sup> Is so, any prior probabilities would not provide a true assessment of risk.

### Human Use Adjustment

As a consequence of the adjustment made to flooding, the human use system of the study area has changed. (Figure 11) Residents (renters primarily) previously living nearest to Kishacoquillas Creek (Zone A) have emigrated, residents in Zone B have, for the most part, remained and purchased flood insurance. In Zone C residents have remained and not purchased flood insurance.

This distribution of adjustments will change gradually as households acting independently enter and leave the area. The distribution could be dramatically changed depending upon the scope and scale of activities undertaken by the Redevelopment Authority.

### New Residences

Ostensibly most residents were evacuated from the study area during the flood. Many returned only to salvage their personal property and move to another home. Others, finding their residence unlivable, were forced to locate new quarters. Most study area households (82%), however, returned and repaired their dwellings. Many of the vacated quarters are being prepared by landlords for new tenants.

When asked how long they expected to be living in their repaired residences, 20% of the households indicated less than five years. (Table 16) Among homeowners, 18% replied that they would seek another residence within five years. Younger households (57% of those with head of the household less than 35 years) compose 57% of those contemplating moving.

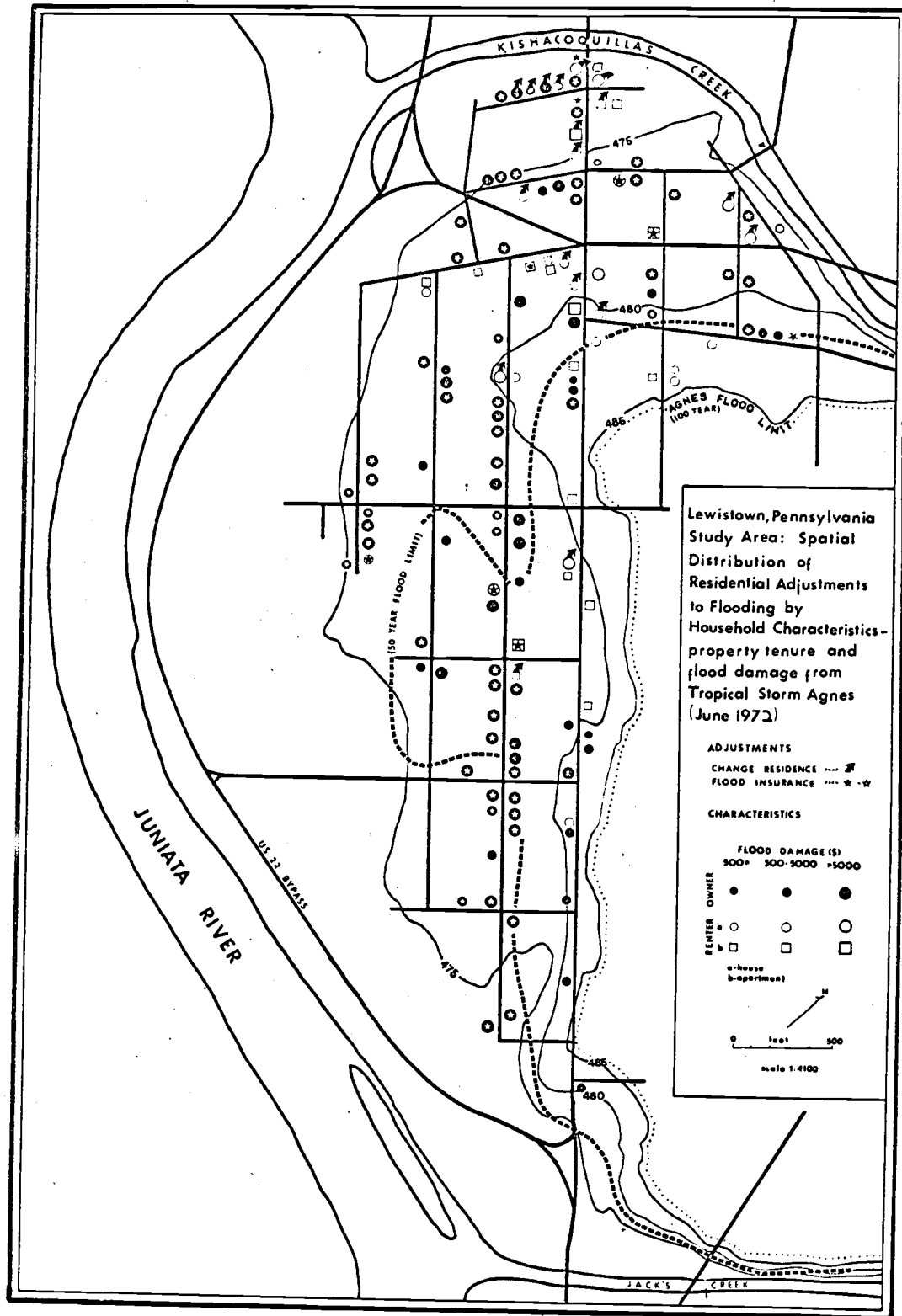


Figure 11

TABLE 16 - THE LEWISTOWN, PENNSYLVANIA STUDY AREA: EXPECTED  
LENGTH OF RESIDENCE OF THOSE HOUSEHOLDS STILL  
LIVING IN THE STUDY AREA SIX MONTHS AFTER THE FLOOD.

Tenure	Expected Length of Residence			Percent Less Than 5 Years
	Less Than One Year	Less Than Five Years	More Than Five Years	
Homeowners:				
w/o mortgage	0	2	38	5%
with mortgage	4	3	25	33%
Renters:				
house	2	1	5	37%
apartment	5	0	9	35%
other	0	0	3	0%
Total	11	11	80	20%
				<u>N=102</u>

Source: Compiled by author from survey results.

As a household moves from the study area, presumably another household will occupy (rent or buy) their quarters. These new residents will, for the most part, not have experienced flood damage at this location (perhaps, never at any location). The consequence of this exchange of residents will be a decrease in flood insurance coverage, particularly in those properties located in zones B and C.

#### Flood Insurance

In their application for flood insurance eligibility, the Lewistown Borough council agreed to comply with the regulations of



the National Flood Insurance Program. These regulations concern the control of land uses within the flood hazard area, which in effect stipulates flood plain zoning.

Local Ordinance. A local ordinance in accord with the Pennsylvania Department of Community Affairs standards would have to be issued establishing flood plain zones with restrictions on future land uses within them. In a model ordinance prepared by the Department, the flood plain is divided into two zones: the floodway and the flood hazard area. The floodway is designated as the area subject to inundation by flood water with a fifty (50) year frequency. Land use regulations within this zone restrict any new structures from being built. Only those uses that need to be near the water such as certain recreation facilities, utilities, docks and piers and agricultural are permitted. The area subject to flooding with a one hundred (100) year frequency and not in the floodway is designated as the flood hazard area. New structures may be built in this area if two conditions are met. First, the finished surface of the ground upon which the structure sits must be one foot higher than the 100-year flood elevation. Second, no first floor or opening below the first floor of any building may be constructed at an elevation of less than one foot above the elevation of the 100-year flood.

Other restrictions deal with the structural anchoring during flooding, and obstructions that might collect debris and raise the water level. A control of materials that are buoyant, flammable,

explosive or in times of flooding could be injurious to human, animal and plant life is provided. Specifications for buildings and structures within the flood hazard area which incorporate the flood preventative recommendations of a registered architect or certified engineer are required.

Residents living in the study area were advised that they may not be eligible for federal disaster relief in the amount that he could have obtained flood insurance. This restriction against duplication of benefits is applicable after flood insurance has been available for at least one year.

#### Redevelopment Project

The repair and rehabilitation of property damaged by the flood was usually undertaken by the individual property owner, utilizing his own resources and those obtained through an SBA loan. But many of the properties located adjacent to Kishacoquillas Creek had experienced the greatest water depth and thus, the greatest damage and emigration of households. (Figure 11) In order to prevent those badly damaged structures from remaining unrepaired and empty, the Redevelopment Authority of Mifflin County (an urban renewal agency), requested and received a HUD "701" planning grant.

Plans. Early plans called for the removal of most structures near the creek and replacement with a contemporary residential-commercial townhouse complex. Households that were required to move, would be assisted in relocating by the authority. Homeowners, if relocated,

could apply the money they received for their property toward the purchase of the townhouse, if they desired to do so, under very liberal terms. If the balance of the payment for their property was not sufficient, the difference would be subsidized by the Federal Government. In fact, the entire redevelopment project was exogenously subsidized, with 75% paid from Federal and 25% from state funds. For sites further away from the creek, the plans called for spot rehabilitation or removal of residences. HUD regulations required that neighborhood citizens committees be formed to participate in the planning of the project.

Early planning progressed under the assumption that the 100-year flood elevation would remain near 476 feet above mean sea level. When the new 100-year elevation was established by the Corps at 485 feet above sea level, the local newspaper declared in headlines, "Kish Creek Area Redevelopment Project Hits Stumbling Block."<sup>71</sup> The problem is shown on the map of the community which points out the difference in land area and the number of residences that are effected by this ten foot elevation of the 100 foot flood level. (Figure 2, 3E)

Initially, the Redevelopment Authority hoped to fill some of the area on which they were planning to locate the townhouse commercial complex, so that these new buildings would be above the 100-year flood elevation of 476 feet. With the new 100-year flood level established at 485 feet, plans to fill have been reconsidered:

The Redevelopment Authority and the Borough Council have requested that the Corps of Engineers restudy and reevaluate the 100-year elevation. They may also request HUD to wave the restrictions placed on land use by the flood insurance program for economic hardship reasons (loss of tax revenue). In the early planning sessions, the redevelopment staff estimated that the existing properties had a value of \$375,000 and the new complex would have a total value somewhere near \$10,000,000! A prize for any community.

Subsequent Activities. If the 485 foot 100-year flood elevation remains relatively unchanged, and the land use restrictions are not relaxed, the community may choose to leave the flood insurance program. It is unlikely they will leave, accepting instead the spot rehabilitation of recoverable properties and the removal of the remainder.

From a long range viewpoint, the removal of structures from the floodplain would appear a sound idea. Property owners would be compensated at pre-flood prices and the damage potential of the flood plain reduced. A resultant reduction of the 100-year flood elevation would follow the removal of structures.

An attempt to place the area near Kishocoquilla Creek under State Park Management has been unsuccessful.

It would be reasonable to assume that many communities in Pennsylvania are faced with a sizable portion of their urban area in a comparable situation. Much maneuvering by local governments can be anticipated. As one observer has summarized, "The National

Flood Insurance Program is going to have its problems. Memories are short, subsidies temporary. Non conforming uses are cancerous, pressures for local development unendingly insistent. The hunch theory of economic analysis confuses sound planning. Developed patterns of legal and social thinking yield grudgingly."<sup>72</sup>

Redevelopment Area Households. When sampled early in the planning period, residents still living in the proposed redevelopment area generally knew of the extent of the area but were uncertain if their property was to be included. (Table 17) About two-thirds of those who replied stated that they would like to live in another area of town if they have to move as a result of the project. The uncertainty expressed concerning redevelopment reflects in part the sketchy information available early in the planning stages. No particular future use for the area nearest Kishacoquillas Creek was most favored. Perhaps the idea of removing familiar buildings, homes, businesses and replacing them with a playground or community garden is not an acceptable alternative to a resident unsure if his property might not be one of those included in the redevelopment project.

## CONCLUSION

Post-diluvial purchase of flood insurance in Lewistown, Pennsylvania may have been influenced by the forgiveness level of the SBA program. Although acceptance is clearly a function of

TABLE 17 - THE LEWISTOWN, PENNSYLVANIA STUDY AREA: RESPONSE  
OF HOUSEHOLDS LIVING IN THE REDEVELOPMENT PROJECT  
AREA SIX MONTHS AFTER THE FLOOD.

QUESTION	RESPONSE				Total
	Yes	No	Not Sure	No Answer	
Is your property located in the redevelopment area?	30	2	1	12	45
Do you expect your property to be included in the project?	12	4	16	13	45
If your home is included in the project and you have to move, would you like to live in the same part of town?	10	19	-	16	45

The buildings closest to Kishacoquillas Creek will all probably be removed. What future use do you most favor for this area?

A playground with swings and so forth . . . . .	1
A community garden . . . . .	0
A park with picnic tables and benches . . . . .	4
An open area landscaped with trees . . . . .	4
A combination of these uses . . . . .	12
None of these uses . . . . .	3
No answer . . . . .	21

Source: Compiled by author from survey results.

reported flood damage for those households receiving substantial damage, this is not clearly the case with those experiencing only moderate damage (less than \$5,000). Had the forgiveness level remained at \$2,500, many more of the residents in the study area of Lewistown would have purchased flood insurance. It has been recognized that the possibility of receiving SBA disaster loans may diminish the attractiveness of flood insurance in communities with pre-diluvial situations. In this analysis, the forgiveness level of the SBA loan is proposed as another deterrent to flood insurance acceptance.

The very high acceptance of Flood Insurance in Lewistown has been influenced by the character of tenure in the study area. When this survey was undertaken six months after the flood, most (almost half) of the renting population had left the area. Eventually when these rental units are repaired and made available, new households will begin moving into them. Not having experienced flood damage themselves, their reception of flood insurance will be considerably less than their neighbors. As indicated, many homeowners were planning to repair their homes to sell them in a few years. This will bring new families into the area, most without flood experience. Their acceptance of the program is not encouraging.

A direct impact of the FMC-Viscose closure upon flood insurance purchase was not noticed. At the time the survey was taken, however, severance and unemployment checks were still a source of income. In years hence, the loss of employment and other economic factors will

erode participation in the program. As memories fade and new residents move into the study area, fewer and fewer policies will be renewed or initiated.

The land-use provisions of the Flood Insurance program were evident in Lewistown. The original blockage of the scale of redevelopment activities planned in the study area as a result of the new 100-year flood level dramatically illuminated the problem of dealing with the uncertainties of natural disasters. Local control of the flood plain has ostensibly passed into state and federal hands. Unless the community leaves the program these controls will remain there.

A jurisdiction conflict is evidenced with the location of new industries in the Viscose Buildings. The Viscose property area is outside the Borough of Lewistown and additional developments near it are possible. For effective and proper management of flood prone lands, larger jurisdictional districts must be created. The concept of a Juniata River Basin flood plain management district does not seem improbable.

The success of the mail questionnaire as a research tool should be attributed to the methodology of its application. For an exhaustive diagnostic analysis of the situation, a few well selected and carefully conducted interviews might be advisable.

The model provided a theoretical base from which to view the insurance acceptance phenomena. By maintaining a broader perspective, insights into the larger and smaller ramifications of the post-diluvial expansion have been observed. The addition of the Exogeneous Resource System strengthened the conceptual functioning of the system. In a



post-industrial nation, the support from large governmental and established service agencies direct and influence the nature of both the perception and acceptance of flood adjusting alternatives.

To be predictive, the model would have to be greatly expanded. Searches for critical thresholds of the intra and inter system dynamics should be undertaken.

The causal model and Bayesian strategy explored provide exciting new directions for hazard research. A more complete understanding of adjustments to natural hazards may be found using these methods and the model as a conceptual guide.

To encourage the continued purchase of flood insurance and to maintain the credibility of the land-use criteria, a flood plain management district should be established in Lewistown that encompasses the area flooded by Agnes. It should be done immediately while the boundaries and memories are still vivid. This district could place a special assessment on individual property owners and residents in the flood plain to pay insurance premiums. Hopefully the flood insurance law could be extended to include reduced rates for collective purchases. By purchasing insurance premiums in this way, insurance coverage is extended and maintained regardless of the flood damage experiences of the resident.

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## APPENDIX A

## ORIGINAL QUESTIONNAIRE

Survey of Lewistown Residents  
Flooded in June 1972.

Instructions: Please complete each item in the survey by placing a check (✓) or X in the space provided. Keep in mind that there are no right answers; you should answer each question as you know, remember, or feel. Your answers will be kept strictly confidential. Please feel free to comment on any question if you wish.

1. About when was your residence built (the one in Lewistown that was flooded)?
  - ☐ before 1920
  - ☐ between 1921 and 1930
  - ☐ between 1931 and 1940
  - ☐ between 1941 and 1950
  - ☐ between 1951 and 1960
  - ☐ between 1961 and 1970
  - ☐ in 1971 or 1972
  - ☐ don't wish to answer
2. Before the June flood which of the following best describes your home ownership?
  - ☐ homeowner without a mortgage
  - ☐ homeowner with a mortgage
  - ☐ renting a house or duplex
  - ☐ renting an apartment
  - ☐ other (such as free rent)
  - ☐ don't wish to answer
3. How many years before the flood did you live in this particular dwelling?
  - ☐ 5 or less years
  - ☐ between 6 to 10 years
  - ☐ between 11 to 20 years
  - ☐ between 21 to 30 years
  - ☐ more than 30 years
  - ☐ don't wish to answer
4. What type of house did you live in before the flood?
  - ☐ one story, no basement
  - ☐ one story with basement
  - ☐ two or more stories, no basement
  - ☐ two or more stories with basement
  - ☐ mobile home
  - ☐ don't wish to answer



5. What kind of home did you live in before the flood?  
(Please don't consider the foundation or basement.)

☐ brick                      ☐ cinder block or cement  
☐ wood frame                ☐ mobile home  
☐ don't wish to answer

6. As best as you remember why did you decide to live  
in this home? (Check the most important reason)

☐ it was close to work  
☐ it was inexpensive to buy or rent  
☐ it was for sale or rent at the time needed  
☐ the property was inherited  
☐ it was close to schools, stores, freinds, relatives  
☐ attractiveness (house size, yard, garage,so forth)  
☐ none of these reasons  
☐ don't care to answer

7. Did you know about the flood danger before you  
moved in?

☐ yes                      ☐ don't remember  
☐ no                        ☐ don't wish to answer

8. Including the 1972 flood, how many times have you  
personally had flood damage at this property?

☐ none                      ☐ three times  
☐ once                      ☐ four or more times  
☐ twice                      ☐ don't wish to answer

9. How much total damage (home and household goods)  
did you have in the June flood?

☐ no damage                      ☐ between \$5000 and \$10,000  
☐ less than \$500                ☐ more than \$10,000 damage  
☐ between \$500 and \$2,500      ☐ don't wish to answer  
☐ between \$2,501 and \$5,000

10. What was the location (on what floor) of your household goods that were damaged by the flood?
- ☐ all on the first floor
  - ☐ all on the first two or more floors
  - ☐ all on the first floor and basement
  - ☐ all on the first two floors and basement
  - ☐ all above the first floor
  - ☐ all in the basement
  - ☐ don't wish to answer
11. Did you receive a Small Business Administration (SBA) loan or grant for flood damage?
- ☐ yes    ☐ don't wish to answer
  - ☐ no
12. What has happened to your total household income as a result of the flood?
- ☐ it has increased
  - ☐ it has remained about the same
  - ☐ it has decreased
  - ☐ don't wish to answer
13. Is someone in your household unemployed as a result of the flood?
- ☐ yes    ☐ don't wish to answer
  - ☐ no
14. Where are you now living?
- ☐ same place as before the flood
  - ☐ in a Government trailer, in or near Lewistown
  - ☐ in another house, in or near Lewistown
  - ☐ in an apartment, in or near Lewistown
  - ☐ away from the Lewistown area
  - ☐ other (such as with relatives)
  - ☐ don't wish to answer
15. Are you still living in the area that was flooded?
- ☐ yes    ☐ don't know
  - ☐ no    ☐ don't wish to answer

16. How long do you expect to live in your present home?

- ☐ one year or less      ☐ as long as possible  
☐ between 1 to 5 years      ☐ don't wish to answer  
☐ between 6 to 10 years

Flood Insurance became available in Lewistown on Nov. 18, 1972.

17. Have you purchased Flood Insurance on your home or household goods?

- ☐ yes      ☐ don't care to answer  
☐ no

18. Do you eventually plan to buy Flood Insurance?

- ☐ yes      ☐ already have flood insurance  
☐ no      ☐ undecided  
☐ don't wish to answer

19. Which of the following best describes why you have decided to buy or not to buy Flood Insurance?

- ☐ it is too expensive  
☐ it is a good way to protect against losses  
☐ bad experiences with insurance  
☐ plan to sell or move soon  
☐ undecided about flood insurance  
☐ none of these reasons  
☐ don't wish to answer

You may have read or heard that the area near Kishacoquillas Creek is being studied as a possible redevelopment project.

20. Do you now live in this area?

- ☐ yes      ☐ don't know  
☐ no      ☐ don't wish to answer

21. Do you expect your property to be included in the project?

- ☐ yes      ☐ don't know  
☐ no      ☐ don't wish to answer

22. If your home is included in the project and you have to move, would you like to live in the same part of town?

☐yes      ☐doesn't apply to me  
☐no      ☐don't wish to answer

23. The buildings closest to Kishacoquillas Creek will all probably be removed. What future use do you most favor for this area?

☐a playground, with swings and so forth  
☐a community garden  
☐a park with picnic tables and benches  
☐an open area, possibly landscaped (trees and grass)  
☐a combination of these uses  
☐none of these uses  
☐don't wish to answer

24. All in all, do you think the project will make Lewistown a more attractive community?

☐yes      ☐don't wish to answer  
☐no      ☐not sure either way

---

The statements on the next pages have been given to large numbers of people across the country. These statements are all matters of opinion: there are no right or wrong answers. It will be used to compare the replies made by people who were flooded in Lewistown with replies from people elsewhere.

Please read each statement carefully. Then mark under the proper column how much you agree or disagree with them. Please give your opinion on every statement.

Do not worry over each item. It is your first impression, your immediate "feelings" about each statement that counts.

Instructions: Please put a check (✓) or X under the column that states how you feel (agree or disagree) with each statement. Remember it is your first impression that counts. So don't spend too much time on each one. Just mark how you feel and move on to the next one.

	Disagree strongly	Disagree somewhat	Unsure, but tend to disagree	Unsure, but tend to agree	Agree somewhat	Agree strongly
25. People who take too many risks lose out in the long run.						
26. It is safest to assume that all people have a vicious streak and it will come out when given a chance.						
27. The only time you should consider making changes is when things are definitely going to pieces and must be put back in order.						
28. Generally speaking, men won't work hard unless they are forced to do so.						
29. Most of the real big problems in this world exist because things change so much.						
30. The biggest difference between most criminals and other people is that criminals are stupid enough to get caught.						
31. In spite of what some people say, the lot of the average man is getting worse, not better.						
32. There isn't much use for me to plan ahead because there is usually something that makes me change my mind.						

- |     |  |  |  |  |  |  |  |
|-----|--|--|--|--|--|--|--|
| 33. | I don't blame anyone for trying to grab all he can get in <u>this world</u> .  |  |  |  |  |  |  |
| 34. | The world is changing so fast that it seems kind of useless to decide what a person ought to do in the <u>future</u> .           |  |  |  |  |  |  |
| 35. | I don't believe that I would invest in a fairly good thing, if I stood much chance of losing my <u>investment</u> .              |  |  |  |  |  |  |
| 36. | Before investing his money, a fellow ought to make sure that he won't lose <u>any of it</u> .                                    |  |  |  |  |  |  |
| 37. | There is nothing to be gained from wavering back and forth and weighing all the facts when making an important <u>decision</u> . |  |  |  |  |  |  |
| 38. | I dislike having things change after I learn how to do <u>something</u> .  |  |  |  |  |  |  |
| 39. | I feel more and more helpless in the face of what is happening in the world <u>today</u> .                                       |  |  |  |  |  |  |
| 40. | It's hardly fair to bring children into the world with the way things look for the <u>future</u> .                               |  |  |  |  |  |  |
| 41. | Nowadays a person has to live pretty much for today and let tomorrow take <u>care of itself</u> .                                |  |  |  |  |  |  |
| 42. | Nowadays a person doesn't really know who he can <u>count on</u> .   |  |  |  |  |  |  |

43. What is the age of the head of the household as of December 1, 1972?

- |  |   |
|--|---|
| <input type="checkbox"/> under twenty      | <input type="checkbox"/> between 46 and 50    |
| <input type="checkbox"/> between 21 and 25 | <input type="checkbox"/> between 51 and 55    |
| <input type="checkbox"/> between 26 and 30 | <input type="checkbox"/> between 56 and 60    |
| <input type="checkbox"/> between 31 and 35 | <input type="checkbox"/> between 61 and 65    |
| <input type="checkbox"/> between 36 and 40 | <input type="checkbox"/> over 65              |
| <input type="checkbox"/> between 41 and 45 | <input type="checkbox"/> don't wish to answer |

44. What was the last year of education completed by the head of the household?

- ☐ some grade school
- ☐ finished grade school
- ☐ some high school
- ☐ finished high school
- ☐ some college or still attending college
- ☐ trade or business school
- ☐ finished college
- ☐ don't wish to answer

45. How many people including yourself are in your household?

- |                                |   |
|--------------------------------|---|
| <input type="checkbox"/> one   | <input type="checkbox"/> six                  |
| <input type="checkbox"/> two   | <input type="checkbox"/> seven                |
| <input type="checkbox"/> three | <input type="checkbox"/> eight                |
| <input type="checkbox"/> four  | <input type="checkbox"/> nine                 |
| <input type="checkbox"/> five  | <input type="checkbox"/> ten or more          |
|                                | <input type="checkbox"/> don't wish to answer |

46. Would you like to receive a summary of the results of this survey?

- ☐ yes
- ☐ no

---

Send the survey in the stamped envelope to this address:

Thomas P. Bresenhan  
Department of Geography  
Oregon State University  
Corvallis, Oregon 97331

## APPENDIX B: First Follow-up Questionnaire

Survey of Lewistown Residents  
Flooded in June 1972.

Instructions: Please answer each question to the best of your knowledge. Feel free to comment on any one of the questions if you care to. Your answers will be kept strictly confidential.

1. About when (in what year) was your residence built (the one in Lewistown that you were living in just before the flood)? \_\_\_\_\_  
\_\_\_\_\_
2. Did you own or were you renting this residence? \_\_\_\_\_  
\_\_\_\_\_
3. How many years before the flood did you live at this residence? \_\_\_\_\_  
\_\_\_\_\_
4. Would you please describe the residence you lived in before the flood ( was it a brick, wood frame or cinder block or cement structure; the number of stories; did it have a basement and so forth). \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_
5. What do you think was the most important reason you had for choosing to live at this residence? \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_
6. Did you know about the flood danger before you moved in? (yes, no or don't remember) \_\_\_\_\_  
\_\_\_\_\_
7. How much total damage (house and household goods) did you have in the flood? \$ \_\_\_\_\_  
\_\_\_\_\_
8. Did you receive a Small Business Administration (SBA) loan or grant for flood damage? (yes or no) \_\_\_\_\_  
\_\_\_\_\_



9. Has your total household income changed because of the flood? (increased, decreased, or remained about the same) \_\_\_\_\_  
\_\_\_\_\_
10. Is someone in your household unemployed because of the flood? (yes or no) \_\_\_\_\_  
\_\_\_\_\_
11. Where are you now living (same house, government trailer, another house or apartment)? \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_
12. How long (how many years) do you expect to continue to live at this residence? \_\_\_\_\_  
\_\_\_\_\_
13. Have you purchased Flood Insurance on your house or household goods? (yes, no, not yet) \_\_\_\_\_  
\_\_\_\_\_
14. Why did you decide to buy or NOT to buy Flood Insurance?  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_
15. How many people, counting yourself, are in your household? \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_
16. What was your age as of December 1, 1972? \_\_\_\_\_

Thank you for you help. Please mail  
the survey in the stamped envelope to:

Thomas P. Bresenhan  
Department of Geography  
Oregon State University  
Corvallis, Oregon 97331

APPENDIX C  
Second Follow-up Questionnaire

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SURVEY OF LEWISTOWN RESIDENTS  
FLOODED IN JUNE 1972

INSTRUCTIONS: Please feel free to comment on any of the items.  
If you don't care to answer any or all of the  
questions please leave them blank. Return the  
survey to the address on the back of the survey.

1. Have you already returned a copy of the survey? (yes or no)  
\_\_\_\_\_
2. About when (in what year) was your residence built ( the one  
Lewistown that you were living in just before the flood)?  
\_\_\_\_\_
3. Did you own or were you renting this residence? \_\_\_\_\_  
\_\_\_\_\_
4. How many years before the flood did you live at this residence?  
\_\_\_\_\_
5. Would you describe the residence you lived in before the  
flood ( was it a brick, wood frame or cinder block house;  
how many stories, did it have a basement)?  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_
6. What do you think was the most important reason you had  
had for chosing to live at this residence?  
\_\_\_\_\_  
\_\_\_\_\_
7. Did you know about the flood danger before you moved into  
this residence? (yes, nor or don't remember) \_\_\_\_\_  
\_\_\_\_\_
8. How much total damage (house and household goods) did  
you have in the flood? \$ \_\_\_\_\_  
\_\_\_\_\_

9. Did you receive a Small Business Administration (SBA) loan or grant for flood damage? (yes or no) \_\_\_\_\_  
\_\_\_\_\_
10. Has your household income changed because of the flood? (increased, decreased or remained about the same)  
\_\_\_\_\_  
\_\_\_\_\_
11. Is someone in your household unemployed because of the flood? (yes or no) \_\_\_\_\_  
\_\_\_\_\_
12. Where are you now living? (same house, government trailer, another house or apartment) \_\_\_\_\_  
\_\_\_\_\_
13. How long (how many years) do you expect to continue to live at this residence? \_\_\_\_\_  
\_\_\_\_\_
14. Have you purchased Flood Insurance on your house or household goods? (yes, no, not yet) \_\_\_\_\_  
\_\_\_\_\_
15. Why did you decide to buy (or not to buy) Flood Insurance?  
\_\_\_\_\_  
\_\_\_\_\_
16. How many people, counting yourself, are in your household?  
\_\_\_\_\_
17. What was your age as of December 1, 1972? \_\_\_\_\_
18. Do you want a copy of the summary of results of the survey?  
\_\_\_\_\_ (yes, no)
- Thank you for your help. Please mail the survey in the stamped envelope to:  
Thomas P. Bresenhan  
Department of Geography-  
Oregon State University  
Corvallis, Oregon 97331

## APPENDIX D

### QUESTIONNAIRE RESULTS

QUESTIONNAIRE RESULTS: THE RESULTS OF A MAIL QUESTIONNAIRE RETURNED FROM HOUSEHOLDS THAT WERE LIVING IN THE AREA OF LEWISTOWN, PENNSYLVANIA FLOODED IN JUNE 1972 BY TROPICAL STORM AGNES.

Hazard zones of  
the study area:

A = Elevations less than 475 feet above mean sea level.  
B = Elevations between 475 and 480 feet above mean sea level.  
C = Elevations between 480 and 486.1 feet above sea level.

QUESTIONS AND ANSWERS	Households living in the study area during the flood.				Households living in the study area six months after the flood.				Households living in the redevelopment area six months after the flood.			
	A	B	C	TOTAL	A	B	C	TOTAL	A	B	C	TOTAL
<b>WHEN WAS YOUR RESIDENCE BUILT?</b>												
before 1920	10	22	14	46	4	18	12	34	4	13	7	24
1921 - 1930	1	42	7	50	1	37	7	45	1	7	1	8
1931 - 1940	4	13	4	21	1	12	3	16	1	3	1	5
1941 - 1950	2	3	3	8	2	1	3	6	0	0	0	0
1951 - 1960	0	2	1	3	0	2	1	3	0	0	0	0
1961 - 1970	0	2	0	2	0	2	0	2	0	0	0	0
after 1970	0	0	0	0	0	0	0	0	0	0	0	0
no answer	2	9	6	17	0	7	5	12	0	5	3	8
<b>TOTAL</b>	<b>19</b>	<b>93</b>	<b>35</b>	<b>147</b>	<b>8</b>	<b>79</b>	<b>31</b>	<b>118</b>	<b>6</b>	<b>28</b>	<b>11</b>	<b>45</b>
<b>BEFORE THE JUNE FLOOD WHICH OF THE FOLLOWING BEST DESCRIBES YOUR HOME OWNERSHIP?</b>	<b>A</b>	<b>B</b>	<b>C</b>	<b>TOTAL</b>	<b>A</b>	<b>B</b>	<b>C</b>	<b>TOTAL</b>	<b>A</b>	<b>B</b>	<b>C</b>	<b>TOTAL</b>
Homeowner without a mortgage	2	29	13	44	1	28	13	42	1	7	6	14
Homeowner with a mortgage	4	34	3	41	4	33	3	40	2	12	0	14
Renting a house or duplex	6	13	10	29	1	4	8	13	1	2	3	6
Renting an apartment	5	12	6	23	2	10	4	16	2	5	1	8
Other (such as free rent)	0	3	1	4	0	2	1	3	-	-	-	-
Don't wish to answer	2	2	2	6	0	2	2	4	-	2	1	3
<b>HOW MANY YEARS BEFORE THE FLOOD DID YOU LIVE IN THIS PARTICULAR DWELLING?</b>	<b>A</b>	<b>B</b>	<b>C</b>	<b>TOTAL</b>	<b>A</b>	<b>B</b>	<b>C</b>	<b>TOTAL</b>	<b>A</b>	<b>B</b>	<b>C</b>	<b>TOTAL</b>
5 or less years	6	26	12	44	1	20	10	31	1	11	3	15
between 6 - 10 years	2	16	4	22	2	14	2	18	2	3	0	5
between 11 - 20 years	4	24	8	36	3	19	8	30	2	4	2	8
between 21 - 30 years	3	9	7	19	1	9	7	17	0	3	3	6
more than 30 years	0	2	2	4	0	2	2	4	0	2	2	4
<b>WHAT TYPE OF HOUSE DID YOU LIVE IN BEFORE THE FLOOD?</b>	<b>A</b>	<b>B</b>	<b>C</b>	<b>TOTAL</b>	<b>A</b>	<b>B</b>	<b>C</b>	<b>TOTAL</b>	<b>A</b>	<b>B</b>	<b>C</b>	<b>TOTAL</b>
one story, no basement	2	3	2	7								
one story with basement	2	8	1	11								
two or more stories, no basement	1	0	3	4								
two or more stories with basement	14	78	26	118								
mobile home	0	0	0	0								
don't wish to answer	0	4	3	7								
<b>WHAT KIND OF HOUSE DID YOU LIVE IN BEFORE THE FLOOD? (Please don't consider the foundation or basement.)</b>	<b>A</b>	<b>B</b>	<b>C</b>	<b>TOTAL</b>	<b>A</b>	<b>B</b>	<b>C</b>	<b>TOTAL</b>	<b>A</b>	<b>B</b>	<b>C</b>	<b>TOTAL</b>
brick	7	12	6	25								
wood frame	10	69	23	102								
cinderblock or cement	2	7	3	12								
mobile home	0	0	0	0								
don't wish to answer	0	5	3	8								

AS BEST AS YOU REMEMBER, WHY DID YOU  
DECIDE TO LIVE IN THIS HOUSE? (Check  
the most important reason)

It was close to work  
It was inexpensive to buy or rent  
It was for sale or rent at the  
time needed  
The property was inherited  
It was close to schools, stores  
friends, relatives  
Attractiveness (house size, yard,  
garage, so forth)  
None of these reasons  
Don't care to answer

A	B	C	TOTAL	A	B	C	TOTAL	A	B	C	TOTAL
1	7	2	10	1	3	2	6				
5	9	1	15	2	7	0	9				
2	37	14	53	0	32	12	44				
1	1	1	4	0	2	1	3				
3	10	8	21	2	10	8	20				
3	8	2	13	2	8	2	12				
4	5	4	13	1	4	3	8				
0	15	3	18	0	13	3	16				

DID YOU KNOW ABOUT THE FLOOD DANGER  
BEFORE YOU MOVED IN?

Yes  
No  
Don't remember  
Don't wish to answer

A	B	C	TOTAL	A	B	C	TOTAL	A	B	C	TOTAL
10	56	16	82	5	49	16	70				
8	30	14	52	3	24	10	37				24
1	2	2	5	0	1	2	3				15
0	5	3	8	0	5	3	8				1
											5

INCLUDING THE 1972 FLOOD, HOW MANY  
TIMES HAVE YOU PERSONALLY HAD FLOOD  
DAMAGE AT THIS PROPERTY?

None  
Once  
Twice  
Three times  
Four or more times  
Don't wish to answer

A	B	C	TOTAL	A	B	C	TOTAL	A	B	C	TOTAL
3	28	13	44								
6	34	5	45								
4	15	2	21								
1	3	0	4								
2		0	2								
3	13	15	31								

HOW MUCH TOTAL DAMAGE (HOME AND  
HOUSEHOLD GOODS) DID YOU HAVE IN THE  
JUNE FLOOD?

No damage  
Less than \$500  
Between \$500 - \$2,500  
Between \$2,500 - \$5,000  
Between \$5,000 - \$10,000  
More than \$10,000  
Don't wish to answer

A	B	C	TOTAL	A	B	C	TOTAL	A	B	C	TOTAL
0	4	3	7	0	4	2	6	0	2	0	2
1	3	4	8	0	2	4	6	0	1	0	1
3	6	5	14	0	5	3	8	0	0	0	0
5	21	13	39	3	16	13	32	3	5	5	13
8	50	6	64	4	45	5	54	2	16	3	21
2	6	1	9	1	5	1	7	1	2	1	4
0	3	3	6	0	2	3	5	0	2	2	4

WHAT WAS THE LOCATION (ON WHAT FLOOR)  
OF YOUR HOUSEHOLD GOODS THAT WERE  
DAMAGED BY THE FLOOD?

All on the first floor  
All on the first two or more floors  
All on the first floor and basement  
All on the first two floors and  
basement  
All above the first floor  
All in the basement  
Don't wish to answer

A	B	C	TOTAL	A	B	C	TOTAL	A	B	C	TOTAL
3	4	5	12								
2	1	0	3								
1	61	3	65								
8	4	1	13								
1	0	0	1								
1	6	11	18								
3	17	15	35								

DID YOU RECEIVE A SMALL BUSINESS  
ADMINISTRATION (SBA) LOAN OR GRANT FOR  
FLOOD DAMAGE?

Yes  
No  
Don't wish to answer

A	B	C	TOTAL	A	B	C	TOTAL	A	B	C	TOTAL
16	81	24	121	8	69	23	100	6	22	10	28
3	9	10	22	0	8	7	15	0	4	0	4
0	3	1	4	0	2	1	3	0	2	1	3

WHAT HAS HAPPENED TO YOUR TOTAL  
HOUSEHOLD INCOME AS A RESULT OF THE  
FLOOD?

It has increased  
It has remained about the same  
It has decreased  
Don't wish to answer

A	B	C	TOTAL	A	B	C	TOTAL	A	B	C	TOTAL
1	2	1	4								
12	67	27	106								
6	20	6	32								
0	4	1	5								

IS SOMEONE IN YOUR HOUSEHOLD UNEMPLOYED  
AS A RESULT OF THE FLOOD?

	A	B	C	TOTAL	A	B	C	TOTAL	A	B	C	TOTAL
Yes	5	11	2	18	2	11	2	15	1	4	1	6
No	12	78	30	120	6	65	26	97	5	22	8	35
Don't wish to answer	2	4	3	9	0	3	3	6	0	2	2	4

## WHERE ARE YOU NOW LIVING?

	A	B	C	TOTAL	A	B	C	TOTAL	A	B	C	TOTAL
Same place as before the flood	8	79	31	118								
In a Government trailer, in or near Lewistown	2	4	1	7								
In another house, in or near Lewistown	1	6	2	9								
In an apartment, in or near Lewistown	7	3	0	10								
Away from the Lewistown area	0	0	1	1								
Other (such as with relatives)	1	0	0	1								
Don't wish to answer	0	1	0	1								

ARE YOU STILL LIVING IN THE AREA THAT WAS  
FLOODED?

	A	B	C	TOTAL	A	B	C	TOTAL	A	B	C	TOTAL
Yes	10	78	27	115								
No	8	10	3	21								
Don't know	0	1	0	1								
Don't wish to answer	1	4	5	10								

HOW LONG DO YOU EXPECT TO LIVE IN YOUR  
PRESENT HOME?

	A	B	C	TOTAL	A	B	C	TOTAL	A	B	C	TOTAL
One year or less	2	10	4	16	1	7	3	11	0	4	1	5
Between 1 to 5 years	1	9	4	14	0	9	2	11	0	2	2	4
Between 6 to 10 years	0	1	0	1	0	0	0	0	0	0	0	0
As long as possible	14	63	20	97	6	56	19	81	5	16	6	27
Don't wish to answer	2	10	7	19	1	7	7	15	1	6	2	9

HAVE YOU PURCHASED FLOOD INSURANCE ON YOUR  
HOME OR HOUSEHOLD GOODS?

	A	B	C	TOTAL	A	B	C	TOTAL	A	B	C	TOTAL
Yes					6	49	4	59	4	17	3	24
No					2	28	26	56	2	9	7	18
Don't wish to answer					0	2	1	3	0	2	1	3

DO YOU EVENTUALLY PLAN TO BUY FLOOD  
INSURANCE?

	A	B	C	TOTAL	A	B	C	TOTAL	A	B	C	TOTAL
Yes					1	13	10	24				
No					1	6	2	9				
Already have flood insurance					5	46	4	55				
Undecided					1	7	8	16				
Don't wish to answer					1	7	8	16				

REDEVELOPMENT PROJECT: DO YOU NOW  
LIVE IN THIS AREA?

	A	B	C	TOTAL	A	B	C	TOTAL	A	B	C	TOTAL
Yes									4	22	4	30
No									0	2	0	2
Don't know									0	0	1	1
Don't wish to answer									2	4	6	12

REDEVELOPMENT PROJECT: DO YOU EXPECT  
YOUR PROPERTY TO BE INCLUDED IN THE PROJECT?

	A	B	C	TOTAL	A	B	C	TOTAL	A	B	C	TOTAL
Yes									1	10	1	12
No									0	3	1	4
Don't know									2	11	3	16
Don't wish to answer									3	4	6	13

REDEVELOPMENT PROJECT: IF YOUR HOME IS  
INCLUDED IN THE PROJECT AND YOU HAVE TO  
MOVE, WOULD YOU LIKE TO LIVE IN THE SAME  
PART OF TOWN?

	A	B	C	TOTAL	A	B	C	TOTAL	A	B	C	TOTAL
Yes									3	5	2	10
No									1	16	2	19
Doesn't apply to me									0	0	1	1
Don't wish to answer									2	7	6	15

REDEVELOPMENT PROJECT: THE BUILDINGS  
CLOSEST TO KISHACOQUILLAS CREEK WILL ALL  
PROBABLY BE REMOVED. WHAT FUTURE USE DO  
YOU MOST FAVOR FOR THIS AREA?

A playground, with swings and so forth  
A community garden  
A park with picnic tables and benches  
An open area, possibly landscaped  
(trees and grass)  
A combination of these uses  
None of these uses  
Don't wish to answer

A	B	C	TOTAL	A	B	C	TOTAL	A	B	C	TOTAL
								1	0	0	1
								0	0	0	0
								0	4	0	4
								0	4	0	4
								1	8	3	12
								1	1	1	3
								3	11	7	21

REDEVELOPMENT PROJECT: ALL IN ALL, DO  
YOU THINK THE PROJECT WILL MAKE LEWISTOWN  
A MORE ATTRACTIVE COMMUNITY?

Yes  
No  
Don't wish to answer  
Not sure either way

A	B	C	TOTAL	A	B	C	TOTAL	A	B	C	TOTAL
								1	11	2	14
								0	3	1	4
								2	6	6	14
								3	8	2	13

WHAT IS THE AGE OF THE HEAD OF THE  
HOUSEHOLD AS OF DECEMBER 1, 1972?

Under twenty  
Between 21 and 25  
Between 26 and 30  
Between 31 and 35  
Between 36 and 40  
Between 41 and 45  
Between 46 and 50  
Between 51 and 55  
Between 56 and 60  
Between 61 and 65  
Over 65  
Don't wish to answer

A	B	C	TOTAL	A	B	C	TOTAL	A	B	C	TOTAL
0	0	0	0	0	0	0	0	0	0	0	0
0	5	1	6	0	5	1	6	0	5	1	6
0	4	4	8	0	4	2	6	0	1	1	2
1	9	3	13	0	6	3	9	0	0	0	0
1	7	0	8	1	5	0	6	0	2	0	2
2	6	2	10	1	3	1	5	1	0	0	1
0	8	4	12	0	7	4	11	0	2	2	4
1	9	1	11	0	9	1	10	0	4	0	4
6	10	1	17	3	10	1	14	2	2	0	4
0	6	7	13	0	5	7	12	0	2	2	4
8	24	8	40	3	22	7	32	3	8	2	13
0	5	4	9	0	3	4	7	0	2	3	7

WHAT WAS THE LAST YEAR OF EDUCATION  
COMPLETED BY THE HEAD OF THE HOUSEHOLD?

Some grade school  
Finished grade school  
Some high school  
Finished high school  
Some college or still attending college  
Trade or business school  
Finished college  
Don't wish to answer

A	B	C	TOTAL	A	B	C	TOTAL	A	B	C	TOTAL
0	4	1	5								
7	6	1	14								
4	20	4	28								
3	34	6	43								
1	5	0	5								
1	3	2	6								
0	5	5	10								
3	16	16	35								

HOW MANY PEOPLE INCLUDING YOURSELF ARE IN  
YOUR HOUSEHOLD?

One  
Two  
Three  
Four  
Five  
Six  
Seven  
Don't wish to answer

A	B	C	TOTAL	A	B	C	TOTAL	A	B	C	TOTAL
7	15	11	33					2	6	4	12
3	19	4	26					0	3	0	3
5	22	6	33					2	8	2	12
3	21	6	30					2	4	3	9
0	6	3	9					0	3	0	3
1	4	1	6					0	1	0	1
0	1	1	2					0	0	0	0
0	5	3	8					0	3	2	5

## APPENDIX E

"Reporter Reviews Experiences During Crucial Flood Hours" by Bob McCool,  
The Sentinel (Lewistown, Pennsylvania). June 26, 1972 (abridged).

". . . For nearly two weeks straight there was nothing but rain, rain and more rain. Most people knew something had to give. Last Monday was the only nice day the area witnessed the entire week. With waters constantly rising, the word finally was issued Thursday (the 22nd) by Civil Defense, 'Be Prepared.'

". . . Already the Kishacoquillas and Jacks Creek were overflowing their banks and causing extensive flooding in the surrounding areas. The Juniata River was rising approximately one foot per hour.

". . . Thursday at work a colleague who was with Civil Defense was keeping everyone informed of the conditions. I live about a block and a half from the river (in the study area), but I wasn't really worried. You could say I was very optimistic concerning the whole situation. I mean, there was a by-pass there to protect us.

". . . Fellow employees had left early in the afternoon to begin removing furniture from their homes or carry it to the second floor or attic. I figured there was plenty of time, which there was. When I was ready to leave for home I remarked to the circulation manager, 'Well, as far as I know I should be in tomorrow, unless I'm stranded on the second floor.'

". . . On the way home I encountered water running across the road. Right away I knew it was worse than I had thought, because there were many times when I drove home through hard thunder showers and never had to drive through water almost a foot and a half deep.

". . . Things weren't really that bad when I arrived home. There were some neighbors removing their belongings, but it seemed many felt as I did, it can't get that high.

". . . Our family went on with our supper just as if it were another evening. However, outside activities got pretty hectic as the night went on.



. . . Radio station WMRF, the only local station operating due to the fact that the flood waters had washed out the other one, kept announcing the various river stages and the areas to be evacuated. When it came to our area, it said it was up to the residents on whether they wanted to evacuate or stay. We weren't too anxious to leave, so we decided to stay.

. . . With my dad at work (at a local trucking firm helping remove things) and my brother helping some neighbors, my grandmother and I began to move some of the furniture to the second floor. After completing that task for the time being, my mother and I sat on the couch and watched our neighbors leave. A few looked as if they were staying but sometime in the next few hours they changed their minds.

. . . Knowing I had to work the next morning, I got to bed about 11 p.m. and everything was still dry except for about two inches of water in the basement. But my brother and I had stuffed a sheet down the drain tightly and placed some weights over the top of it. So I thought I was going to have a good nights' sleep and maybe find a foot or two of water at most in the street when I awoke.

. . . I didn't even get to sleep when my brother came charging into the room and told me my dad had said to move the cars to higher ground. So, if the high water came, we could get out.

. . . (after moving the cars) my brother and I headed home. As we hit the corner of the street on the way home, we were surprised to find that all activities on the street had ceased. When we had left the power (electricity) was off, but there were plenty of trucks and cars in the area emptying homes. However, on our return everything was quiet and smothered in total darkness.

. . . As we approached the corner of my street, we found the answer, the cold flood water had finally come. We were now wading through water about a foot and a half deep. Jogging home, we found our mother and grandmother waiting at the front window, hoping we were all right. The water was at the top of the curb at that time.

. . . Several neighbors were making their final preparations, as we did when my dad returned home. We carried most of the furniture and valuable objects upstairs just in case it did get higher than we expected.

. . . With everything done that we could do, I decided to go to bed (about 1 a.m. Friday). The water in the street was just atop the curb and the water in the basement was nearly three inches deep. No way was it going to be that bad.

. . . At 5 a.m. my father woke my brother and I up and when I looked out the front window there was at least five feet of water out there. It had just reached the level of our front porch. It was my mother who had awakened first when she smelled oil and then heard a gurgling and thumping sound coming from downstairs. Immediately she alerted my father who went to investigate only to find that if we were going to get out, it would have to be by boat.

. . . We didn't know how high the water was going to rise. The flood of 1936 had sent water right to the ceiling of the first floor. But the way it had risen in just a few hours, we decided we had better call for help. The announcers on the radio repeatedly stated that if anyone needed to be rescued they were supposed to phone the station or Civil Defense. In our case, there was only one problem, we couldn't call out when we tried at first. There wasn't really anything we could do at that point. We watched and hoped a boat would pass and also hoped the water would stop climbing. It was hours before any hope arose.

. . . (after completing the phone call) It was finally about 9 a.m. before we heard the boat coming down the street. The water was approximately 2 1/2 feet deep in the living room by this time. We flagged down the boat, stuck our cat in the attic with some food and milk, carried my mother and grandmother out to the boat, which was right at our front railing. We were taken (to higher ground) where a crowd of persons had gathered to witness the rescues.

. . . There were plenty of places in the south end for us to stay. I decided to stay at a friend's house. At first my family went to (one of the emergency housing shelters) but it was very crowded so they too went to a friend's house.

. . . (the next day on the way to the office) I heard on the radio that you would have to have a pass to get into the southside, but I never dreamed it would cause so many problems. Persons already in the southside were to go (a central place) to get the passes while others were to go to the Borough Hall. Two and a half hours earlier I had left the area, and now wasn't permitted to enter my place of residence without a pass.

. . . At the Municipal Building I found out that they were not issuing any passes to the southside until 8:30 p.m. and they wouldn't be good until Sunday morning due to a 9 p.m. curfew that was levied throughout the area because of the problem with looters. Many persons in the southside were in the same situation. They were not permitted to go to the area in which they were living until the next day. Finally the Chief of Police permitted passes to be issued to southside residents and allowed them to go home.

. . . When we went home we found that the water had risen only two feet higher than it had when we left. Of course everything was covered with mud and oil, but so was every home in the immediate vicinity."

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