PERCEPTION OF THE FLOOD HAZARD IN MANHATTAN, KANSAS

by

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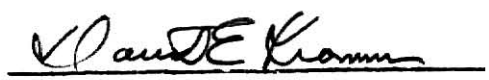
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CHAPTER ONE

INTRODUCTION

History has shown that human activity and natural systems do not always exist together in complete harmony. There have been countless instances where humans have struggled to survive the harsh and sometimes brutal conditions which occur periodically in the natural environment. The interaction between human habitation and the natural environment nonetheless exhibits assets as well as liabilities. The assets may appear in the form of various types of resources and resource commodites such as rich volcanic and alluvial soils along with the high agricultural potentials which accompany them, whereas the liabilities may be represented by such damaging events as floods, blizzards, earthquakes, drought, tornadoes, and other natural hazards. To those who live in Kansas, meterological hazards such as floods, tornadoes, and drought represent natural threats to both life and property. Because of the threats posed by these phenomena, it is imperative that scientists study the relevant

relationships which exist between humans and the natural environment. These relationships often affect the future welfare of the individuals and communities which are exposed to the natural hazards.

This thesis is concerned with people's perception of hazards, with the specific issue being the human occupance of floodplains in an urban area. Because of a curiosity regarding floodplain settlement, I wish to investigate the perception of residents of Manhattan, Kansas toward the potential danger of a flood. The intent is to determine the knowledge of Manhattan residents concerning the actual flood hazard potential and the coping mechanism used by persons with different experiences with and exposure to floods.

The thesis is organized into four chapters. This first chapter will discuss floods, the problems which accompany them, and other background information necessary for understanding the phenomenon and perception of the hazard. Included is a review of the Manhattan flood hazard and a

discussion of the research problem. Chapter Two explains the selection of the study area and describes it in terms of its physical and socio-economic characteristics. The chapter also introduces the methodology, consider the survey sample, and examines the questionnaire used to obtain responses for the determination of hazard perception. Chapter Three interprets flood hazard perception in Manhattan. The discussion is centered around the tabulation of the survey results and an analysis of the factors associated with perception and the significance of flood experience. Chapter Four draws together all the findings stemming from the above analysis to formulate conclusions and implications. Comparisons with previous findings in natural hazards studies will be included along with suggestions for future research.

Physical Properties of Floods

Since floods occur frequently throughout the United States, most of us have at least some idea of what they are. However, an important part of individual awareness and response level is the knowledge of the physical conditions which cause floods and the damage they can inflict.

A flood may be defined as the condition in any stream, lake, or sea when the water rises on to land which is normally dry.[1] Most larger streams have a zone of low, flat ground bordering the channel in which they flow on one or both sides which is inundated periodically by stream water. This adjacent, low, flat ground is called a floodplain. The inundation of the floodplain normally occurs when abundant supplies of surface water combine with the effects of a high water table and saturated soil to create more runoff than can stay within the stream channel. Such inundation is deemed a flood. Occasional flooding does not necessarily prevent the cultivation of crops on the floodplain after the water has receded, nor does it always interfere with the vegatation which is commonly situated over low, marshy floodplains in most humid regions. Still higher discharges of water, the rare and disastrous floods which may happen as infrequently as a decade or longer, often inundate ground high above the floodplain.[2]

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[1]John J. Hidore, Physical Geography: Earth Systems (Glenview, Illinois: Scott, Foresman & Company, 1974), p. 161.

[2]Arthur N. Strahler, Physical Geography (New York: Wiley & Sons, 1960), p. 341.

All natural stream floods are due primarily to surface runoff.[3] The runoff may result from heavy rains, melting snow, land use, or a combination of all three. Floods caused by rain can result from either short periods of high intensity rainfall (such as rates of 2.5 centimeters per hour or 25 to 45 centimeters per day) or from prolonged periods of steady rains continuing for several days.[4] Flood runoff from small watersheds often originate from sources different than floods on large drainage basins. Small watersheds are often arbitrarily defined, though the average size appears to be 25 square kilometers (10 square miles) or less. It is not uncommon for watersheds of this size to be completely covered as a result of a single convective storm, and most floods on small drainage basins are the result of such cloud bursts. The rain is so intense that the stream channel cannot carry off the water as fast as it falls. The floods which ravaged parts of Kentucky and Arkansas in 1978 were the result of extremely heavy rainfall lasting less than one day.

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[3]Hidore, p. 161.

[4]Ibid.

Flooding on large drainage basins requires extended precipitation from cyclonic storms or massive snowmelt. The 1973 flood along the Mississippi River is a good example. Rain and snow from the winter left the upper valley very wet and the ground was saturated, so that when the spring snowmelt occurred, nearly all the water ran off the land surface.[5] The result was one of the largest floods in recent history on the lower Mississippi River.

The frequency and extent of floods also varies with the type of stream channel. Streams with deeply cut channels are less likely to flood than streams with low banks. The Colorado River in the Grand Canyon or the Arkansas River in the Royal Gorge would be less likely to flood than the Kansas or Big Blue Rivers near Manhattan because of their lower capacity for holding excess water.

The frequency and extent of floods also varies with the time of year and the time occurrence of floods differs over the earth's surface. There are many streams around

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[5]Ibid.

the Red Sea, for instance, that remain dry most of the year but that flood during rainy periods. Many areas in southern Asia experience floods during the monsoon season which begins in April and ends in October. Figure 1 shows the flood seasons for much of the United States and Canada.

While floods are clearly a serious problem for both the nation and the world as a whole, they are only one of many disastrous events in nature which are called natural hazards. It is useful to discuss the meaning of natural hazards and to review Hazards work by geographers.

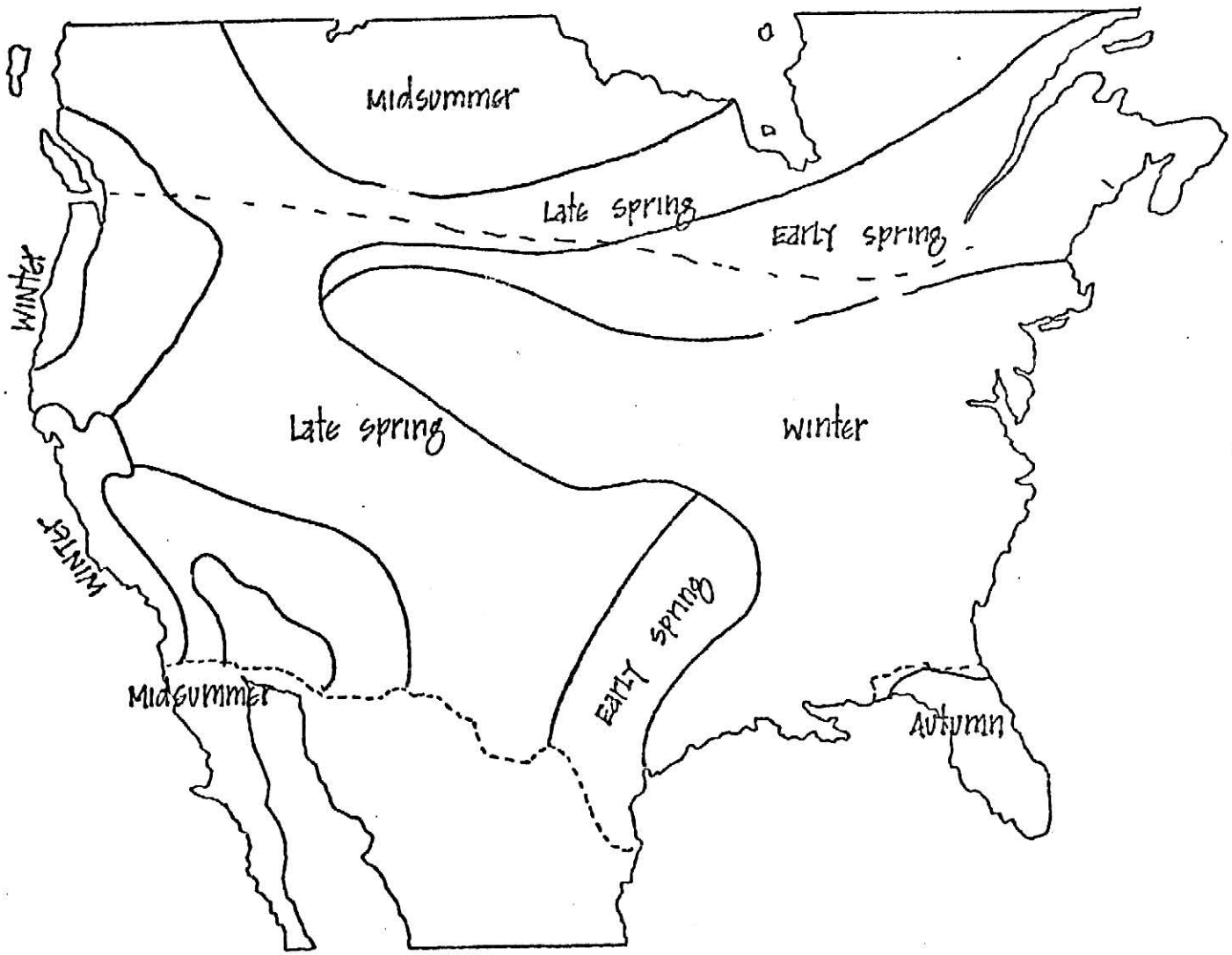
Natural Hazards Defined

What humans feel and think about the natural environment appears to play a substantial role in how they behave in and alter that environment. If people feel that some aspect of the natural environment represents exposure to danger or harm, then that aspect of the physical environment is usually called a natural hazard.[6] A distinction

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[6]Gilbert F. White, Ian Burton, and Robert W. Kates, The Environment as Hazard (New York: Oxford University Press, 1978), pp. 19-20.

FIGURE 1— FLOOD SEASON MAP OF THE U.S. AND S. CANADA



Source: J. Hiddore (1972) p. 161.

can be made between those extreme events in nature which are not necessarily hazardous to people and those that are. This is because the natural events system--the group of wind, water, and earth processes--largely operates independently of human activity. Being separated from humans, an extreme event such as lightning would not be classified as a hazard. The hazard involves the risk encountered in occupying a place subject to lightning (see Figure 2 for a classification of hazards based on the natural processes characterized by extreme events). According to White, Kates, and Burton:

> Although the hazard results from the interaction of natural and social systems, the two cannot be equated as causes. Natural systems are neither benevolent nor maliciously motivated toward their members; they are neutral, in the sense that they neither prescribe nor set powerful constraints on what can be done with them. It is people who transform the environment into resources and hazards, by using natural features for economic, social, and aesthetic purposes.[7]

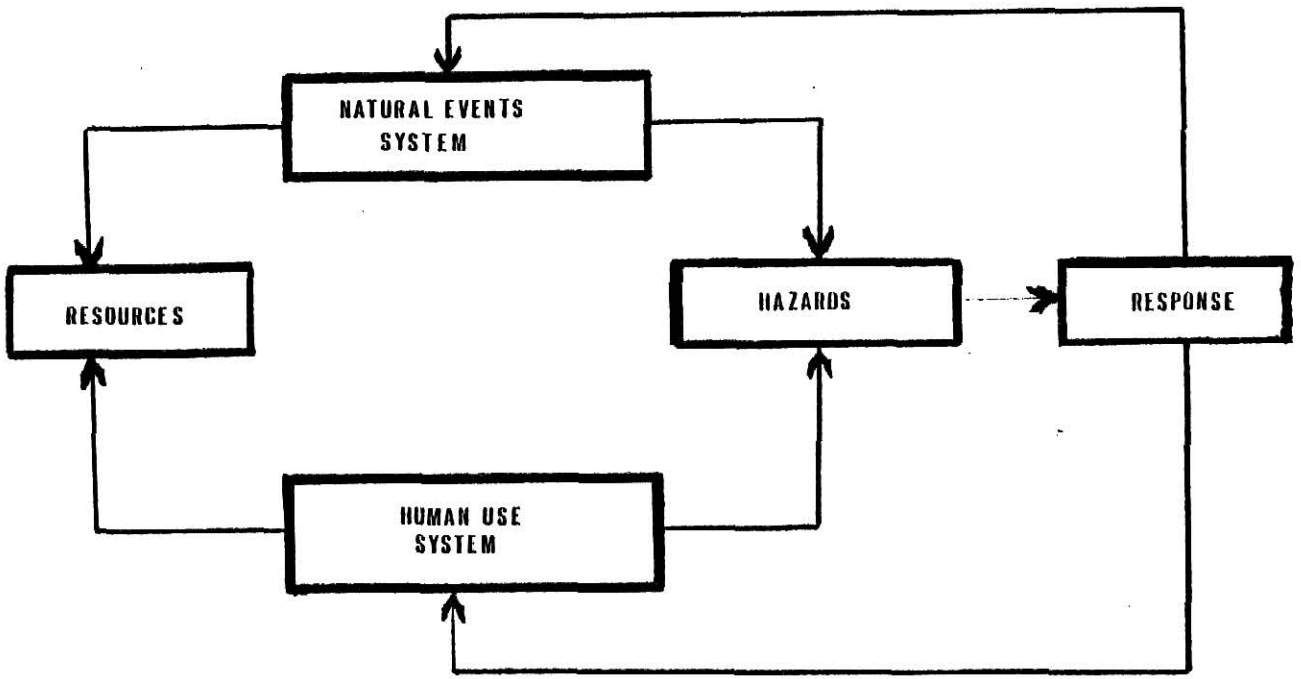
Hewitt and Burton[8] have demonstrated that sometimes human activities so modify the natural conditions as to

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[7]Ibid.

[8]Kenneth Hewitt and Ian Burton, The Hazardousness of a Place (University of Toronto Department of Geography, University of Toronto Press, 1971), p. 15.

FIGURE 2 — RESOURCES AND HAZARDS FROM NATURE AND HUMANS



Source: Gilbert White, et. al.
The Environment as Hazard

create new hazard potential. For example, the flood potential of the greatest known rainfall in a community may become much higher following land-use changes, although rainfall of that proportion has not occurred since the changes were made. Events for which there is no precedent in the current knowledge of a population can create the greatest emergencies. Locally, they would be so rare that it would be difficult to convince people to build safeguards into their normal patterns of existence. Nationally, however, these unprecedented occurrences can represent a recognizable problem even in a short-term sense.

Since it is possible that large portions of a population may not have had previous contact with a particular hazard, they may not be aware of the potential threat of the hazard. In any case, no degree of experience with a hazard will protect people unless previous exposure has led to adjustments which may decrease its detrimental effects. Because each individual's level of awareness and type of response may differ as a result of previous experience,

the role of government in providing information to increase citizen knowledge of possible hazards can be important. Recognizing this, the Army Corps of Engineers and many other government agencies have gone to great lengths to increase public awareness levels where natural hazards are concerned. State and local governments have also produced substantial literature designed to inform the public of precautionary measures and relief-rehabitation programs. Before looking at the magnitude of the flood hazard, it is useful to examine natural hazards in terms of their dimensions as they pertain to human response.

According to White et al., there are seven dimensions of natural hazards which are important in measuring human response. There are magnitude, frequency, areal extent, speed of onset, spatial dispersion, and temporal spacing.[9] Magnitude, frequency, and areal extent describe the strength or force of an event, how often it can be expected to occur, and over what area it will happen. As a rule, the more

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[9]White et al., pp. 22-24.

frequently the hazard occurs, the greater the need for measures to prevent it. The larger the area affected, the larger the proportion of the population likely to be subjected to loss or disruption.

The significance of the speed of onset and duration dimensions largely relate to the provisions of emergency preparations, if they are possible. In instances where a hazard strikes quickly, little preparation can be made. However, if there is a long period of time between the onset and peak, the range of possible responses is considerably greater. Prediction of certain hazardous events may be based on observations of phenomena which may preceed the event such as air masses for floods or tectonic stress for earthquakes. In the case of duration, the shorter the time, the less that can be done during its occurrence. The longer the event continues, the more mitigating actions can be taken. The main function of spatial dispersion is to determine over which area a pattern of hazard-response is needed. Thus, measures to lessen the effects of an earthquake depend on knowledge of where the earthquake

is likely to occur. Temporal spacing or the sequence of events implies the scheduling of human activities around hazardous events, especially where hazards are a seasonal occurrence.[10]

Dimensions of Flood Problems in the United States

Floods are the most widespread natural hazard in the United States.[11] Almost every community in the nation has experienced some flooding, with most resulting from inadequate drainage systems for runoff water produced by heavy rainfall.[12] Floods also account for larger annual property losses than any other geophysical hazard. (See Table 1) Although the total property losses from floods have increased in the past thirty years, the per capita loss has remained relatively constant. According to White, the chief factors that are responsible for the increase

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[10]Ibid., p. 23.

[11]Gilbert F. White, Flood Hazards in the United States: A Research Assessment (University of Colorado, Institute of Behavioral Science, 1975), p. xiii.

[12]Ibid.

in flood losses are: 1) changes in price levels, 2) improvement of accuracy and coverage of data on losses, 3) increases in the occupance in many floodplains, and 4) changes in the frequency and magnitude of flooding.[13] All of these factors seem to suggest that flood losses are likely to increase in the future.

The amount of damage by flooding in the United States is phenomenal. It costs us in excess of a billion dollars a year, half of which is derived from agricultural losses.[14] A major part of these flood losses have occurred in urban areas. In terms of flooding, the worst natural disaster in the history of the nation was the flooding caused by tropical storm Agnes in June of 1972. The highest loss of life in one flood--238 deaths in all--occurred that same month in Rapid City, South Dakota. Tropical storm Agnes also caused extensive damage in the northeast portion

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[13] Ibid.

[14] Hidore, p. 163

TABLE 1

MAJOR CAUSES OF DAMAGE RESULTING FROM NATURAL HAZARDS

Cause	Percent of all losses ($)
Floods	40
Tropical Cyclones	20
Earthquakes	15
Drought	15

(Source: The Environment as Hazard. Gilbert White, et al.)

of the country from New York to Virginia where at least 118 people lost their lives. In monetary terms, it has been labeled the greatest material disaster ever in the history of the United States.[15] It is difficult to compare damage from year to year as the inflationary state of the economy has caused rapid increases in the value of land and structures. Nevertheless, it can be seen that destruction from floods is expensive.

[15] White, et al., op. cit., p. 9.

Dams, levees, and other instruments of flood control require large capital expenditures. From 1936 to 1975, federal expenditures for flood control had reached nine billion dollars.[16] In addition, the government spends approximately three million dollars annually on a forecasting system, and supports a subsidized flood insurance system, relief and rehabilitation assistance to needy individuals and local governments, and research devoted to flood problems.[17] It is difficult to determine the total amount of money spent by the government, though it is clear that the greatest investment in flood control works is by the Corps of Engineers. Flood control alone, discounting the multi-purpose construction projects, represents seven to ten percent of the budget for works performed by the Corps of Engineers. One estimate for total annual construction expenditures for both types of projects chargeable to flood control is between four and five hundred million dollars.[18]

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[16] Ibid., p. 64.
[17] White, op. cit., p. 28.
[18] Ibid.

Further examination of the costs of flood control reveals that warning systems operate at a cost of 7 million dollars annually, with flood forecasting accounting for the greatest expense. Federal relief and rehabilitation expenditures may reach a billion dollars in a year that has several great disasters. The cost of flood-proofing new buildings is on the order of five percent of all construction costs.[19] Considering the high cost of flood control, one has to wonder about human intrusion into floodplain areas--especially if floods increase in magnitude.

The possibility of larger and more expensive floods seems even more likely in the future as there is substantial evidence that flood heights are increasing. According to Hidore,[20] there is little evidence of changing storm intensity, but a lot of evidence that humans have altered the physical characteristics of drainage basins by modifying land use, paving surfaces, and expanding cities into

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[19]Ibid., p. 31.

[20]Hidore, p. 162.

floodplains.[21] Because of these changing physical characteristics, the number and intensity of floods may increase and represent a much greater hazard to humans.

The dimensions of flood problems are great and floods are not likely to disappear. During the 1973 and 1979 floods of the lower Mississippi, even the opening of tributary floodways and the flooding of retarding basins failed to prevent wide-spread flooding in areas which were supposedly flood-proofed areas. Hidore suggests that: "the only sure way to prevent floods is to prevent the precipitation that causes the floods."[22] He cites the West Virginia floods of 1969 and the Black Hill floods of 1972 to illustrate this point, saying that they could not have been predicted, let alone prevented. In summary, it can be said that floods affect hundreds of communities throughout the world, and the damage they produce costs millions of dollars annually. Furthermore, despite government efforts to initiate control,

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[21] Ibid.

[22] Ibid.

floods persist and may even increase in the future. In light of these dimensions, it is important that those who choose to live in flood hazardous areas recognize the danger which may accompany that choice.

Humans against Nature

Humans are continually threatened by the extreme events which occur in nature. Hundreds of lives are lost annually due to inaccurate assessments of the hazard potential of naturally occurring phenomena. Many hazardous zones have been settled because no extreme events were known to have occurred in the area, for people estimate the likelihood of an extreme event in terms of known previous instances of occurrence. In most areas unrecorded extreme events are within the potential range of action of various physical conditions and historical records are not always extensive enough to provide precedents.[23] To give a prime example of this, we can view the events which occurred at Wilkes-Barre in the Wyoming Valley of Pennsylvania. It was here that the U.S. Army Corps of Engineers built a flood project

[23]Hewitt and Burton, p. 15.

designed to protect against floods of the magnitude of the previously record flood of 1936. However, in June of 1972, the dam was over topped. Nearly 100,000 people were evacuated from the city following a warning before the flood walls began to cave in later that day. Thus, it is evident that the Corps of Engineers did not accurately evaluate the hazard potential. It was only after the flood that the people and governments most affected began to promote insurance and land-use planning to supplement protection works. If the appraisal of the flood hazard had been more accurate, this encounter with nature would have been less severe.

Another example of an area where floods exceeded those of historical record is Corning, New York. The large population of the Chemung Valley at Corning, New York was also overrun by flood waters. Levees were destroyed at other nearby towns and overall forty percent of the total damage to the area occurred in towns and cities where flows exceeded the capacity of protection works.[24] The inhabitants of the

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[24]White, et al., op. cit., p. 9.

area had believed that their protection works would protect them in the event of wide-spread flooding. In fact, they trusted these works so much that only a few hundred residents had government subsidized flood insurance.[25]

The reasons for conflicts between humans and nature usually coincide with the failure to accurately appraise the hazardousness of a place. The consequence of inaccurate appraisals is usually the loss of life and or property. What happened at Wilkes-Barre and in the Chemung Valley are just two examples of instances where humans have underestimated the potential of a natural hazard. Therefore, the natural hazard represents a serious threat to humans. Because of this threat, natural hazards and their effects are studied in a variety of scientific disciplines, including Geography.

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[25]White, et. al., op. cit., p. 9.

MAN-ENVIRONMENT TRADITION IN GEOGRAPHY

The relationship between humans and their environment has traditionally been a major concern in geography. For much of the discipline's history, geographers have dealt with an assortment of hypotheses and generalizations regarding the processes implied in man-land interactions. In 1922, Harlan H. Barrows introduced a school of thought which recommended studying geography as human ecology. Barrow's Human Ecology focused on the study of human adjustment to specific natural environments.[26] This approach, from the standpoint of human adjustment to the environment rather than from that of environmental influence, was primarily concerned with those adjustments made to land-forms as an element of the natural environment. The idea of people as agents in the modification of the surface of the earth is also an old and respected theme among geographers. Previous geographers have focused either on the physical or the human element or have demonstrated

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[26]Harlan H. Barrows, "Geography as Human Ecology," Annals of the Association of American Geographers, Vol. 13 (1923) p. 1.

a concern with the impact of one on the other.[27] Sixty years before Barrows had begun to reflect on humans and the environment, George Perkins Marsh in his Man and Nature, showed the far-reaching consequences of human actions on the earth.[28] Ellen Semple and Ellsworth Huntington, contrary to Marsh's point of view, were interested in the effects of the environment on humans.[29] Their basis belief was that human behavior was somehow influenced by environmental conditions.

In more recent years, many geographers, following the man-land tradition, have utilized the human behavioral sciences as a means to better understand human-environmental relationships. One of the most revealing approaches of geographer, working from a behavioral perspective, is perception.[30] The notion of perception is not a totally new innovation as concerns

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[27]Roger Minshull, The Changing Nature of Geography (London: Hutchinson and Company Ltd., 1972), p. 102.

[28]George Perkins Marsh, Man and Nature (New York: Scribner, Armstrong and Company, 1864).

[29]Preston E. James and Clarence F. Jones, American Geography Inventory and and Prospect (New York, 1964).

[30]Perception, for the purposes of this thesis, refers to an individual's conscious awareness through the senses of the surrounding natural environmental conditions. Awareness refers to a persons knowledge or realization of flood hazard. (see Myra R. Schiff, "Some Theoretical Aspects of Attitudes and Perception, University of Toronto, Natural Hazard Research, Working Paper No. 3, 1968).

geography. Many cultural geographers have long been concerned with it under the name of cultural appraisal.[31] The discussion of cultural differences by Alexander Spoehr in the interpretation of natural resources clearly shows the similarities between the two concepts.[32] Spoehr demonstrates that cultural differences, like perceptual differences, greatly influence one's ideas of the value and uses of natural resources. The cultural geographers have mainly used this idea when considering the perception of people from far away or long ago.[33]

The earliest methodological discussion along the lines of the present conception of perception in geography was that initiated by William Kirk in which he discussed the concept of the behavioral environment as a solution to problems associated with possibilism.[34] He suggested thinking

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[31]Thomas Saarinen, Environmental Planning: Perception and Behavior (Boston: Houghton Mifflin Co., 1976), p. 31.

[32]Alexander Spoehr, "Cultural Differences in the Interpretation of Natural Resources," Man's Role in Changing the Face of the Earth (Chicago: University of Chicago Press, 1956), pp. 93-102.

[33]David A. Hill, The Changing Landscape of a Mexican Municipio: Villa Las Rosas, Chiapas, Department of Geography Research Paper No. 91, University of Chicago (Chicago: 1964) pp. 100-105.

[34]William Kirk, "Historical Geography and the Concept of the Behavioral Environment," Indian Geographical Journal, Silver Jubilee Edition (Madras; Indian Georaphical Society 1952), pp. 152-160.

of a region as a "gestalt," a whole which is something more than the sum of its parts. Kirk was arguing for a more workable concept of the man-milieu relationship and helped develop the idea of cognitive behaviorism. Other noted geographers like Yi Fu Tuan and Joseph Sonnenfield have also advanced ideas which involve the use of perception in geography. Tuan called for more sensitive portrayals of the earth by geographers and has discussed the symbolic significance of certain landscapes for western civilization.[35] Sonnenfield used the framework of adaptation level theory to evaluate measures of environmental attitude and sensitivity among a number of arctic populations in Alaska.[36] He emphasized the sources of perceptual variability. Sonnenfield's study suggests that the way in which environmental attributes are perceived is a function of culture, economy, personality, and experience as well as individual

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[35] Yi Fu Tuan, "Topophilia or Sudden Encounter with the Landscape," Landscape, XI (Autumn, 1961), pp. 29-32.

[36] Joseph Sonnenfield, "Environmental Perception and Adaptation Level in the Arctic," Paper presented at the 61st annual Meeting of the Association of American Geographers at Columbus, Ohio, April 20, 1965.

and racial physiology. All of these attributes will condition the perception of the stimulus and, thus, the adaptation level which decides the individual's sensitivity to that stimulus.

Perception in Resource Management

The field of natural resources is another in which the tool of perception has many useful applications.[37] Firey, a sociologist, suggests that there are three distinct ways of explaining resource phenomena. These are the ecological, focusing on what is physically possible, the ethnological, concerned with what is perceived to be adoptable, and the economic, which considers what would be profitable.[38] These approaches have been explored also by geographers, as is evidenced in the framework employed by Gilbert White.[39]

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[37]Thomas Frederick Saarinen, Perception of the Drought Hazard of the Great Plains (Chicago: Department of Geography Research Paper No. 106, University of Chicago, 1966), p. 35.

[38]Walter Firey, Man, Mind and Land: A Theory of Resource Use (Glencoe, Free Press, 1960), p. 256.

[39]Gilbert F. White, Human Adjustment of Floods (University of Chicago, Department of Geography Research Paper No. 29, 1945).

He uses the term theoretical range of choice to refer to the total adjustments and uses practiced in similar environments of the past. Several other studies have utilized comparable frameworks. In a study of the concepts of perception in natural resources, Lucas delimited wilderness areas within a wider park area according to people's perceptions. Lucas suggest that the variations in wilderness perception between different users, such as canoeist and motor boaters, may provide guidelines for future zoning of areas for different uses.[40]

Porter investigated the way certain groups of people in East Africa perceive their natural environment.[41] He found, for example, that the Pokot people in Kenya had a discriminating perception of the functional differences in soil types and altitudinal zones of their environment. They did not use the same standards or criteria as a western scientist might have, but their scheme was meaningful in Pokot life.

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[40]Robert Lucas, "Wilderness Perception and Use: The Example of the Boundary Waters Canoe Area," Natural Resources Journal, III, No. 3 (1963), pp. 394-411.

[41]Phillip W. Porter, "Pokot Ideas Concerning Soil," A Chapter on Pokot (Mimeographed), date unknown.

Perception in Natural Hazards Research

The forerunner of the present study and the strongest organized research tradition pertaining to natural hazards began in 1945 with a series of floodplain studies at the University of Chicago. The first of these studies was initiated by Gilbert White and was concerned with human adjustments to floods.[42] During this early stage, the main emphasis was on physical factors affecting such adjustment. Later studies turned increasingly toward an assessment of social, economic, and behavioral variables and the ways in which these interacted to form the observable patterns of floodplain occupance in rural and urban areas.[43]

In two studies of a companion series by Kates and White, Kates concentrated more directly on the perception of the flood hazard and on the range of choice as it related to the decision-making, whereas White looked at the circumstances under which private and public managers chose among

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[42] White, loc. cit.

[43] Ian Burton, Types of Agricultural Occupance of Flood Plains in the United States (University of Chicago, Department of Geography Research Paper No. 75, 1962).

several possible adjustments. Both found experience to an overwhelming factor in the perception of resource managers. In his study, the floodplain dweller's perception of the flood hazard was strongly affected by what Kates termed "the prison of experience." White found that there was a strong similarity between those who perceive adept structural measures and their time in occupance on the floodplain. He also found similarities between the perception or adoption of emergency measures and one's location within the reach of the latest major flood.[44]

Some of the work which was derived from the floodplain research tradition tended to focus more directly on the perception of those who managed the resources. Thus, Burton and Kates set out to compare the floodplain and the seashore and the perception of the hazard of each by the respective groups of inhabitants. They found that although the coastal managers had a greater awareness of the hazards of storm

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[44]Robert W. Kates, Hazard and Choice Perception in Floodplain Management, Department of Geography Research Paper No. 78, University of Chicago (Chicago: By the author 1962); Gilbert F. White, Choice of Adjustment to Floods, Department of Geography Research Paper No. 93, University of Chicago (Chicago: Department of Geography, 1964).

than did urban floodplain dwellers, the coastal dweller tended to underestimate the frequency, likelihood, or probability of storm damage.[45] Three explanatory factors for the variation in the perception of natural hazards among users of the same resource were given. The first depended on the relationship between the hazard and the dominant resource use, with a greater hazard perception where the hazard is directly related to the resource use. The second was that the frequency of natural events coincides with perception of the hazard. The third said that perception is directly related to experience. Burton and Kates found that social class and education were not associated with perception of hazards.[46] If these factors hold true over the complete span of natural hazards, then similar results might be expected in this study. Similarly, there should be variations in the flood hazard perception from area to

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[45] Ian Burton and Robert W. Kates, "The Floodplain and the Seashore," Geographical Review, LIV, No. 3 (1964), pp. 366-385.

[46] Ian Burton and Robert W. Kates, "The Perception of Natural Hazards in Resource Management," Natural Resources Journal, III, No. 3 (1964), pp. 412-441.

area due to differences in the frequency of flood occurance or possibly due to the degree of exposure to flood. Keeping these possibilities in mind, let us examine the Manhattan flood hazard.

Manhattan Flood Hazard

Past records show that major floods have occurred at Manhattan. By comparison, however, much larger floods have occurred in nearby areas, such Ogden and Junction City.[47] Although the completion of Tuttle Creek Reservoir and the construction of a levee south of Manhattan have afforded considerable protection from floods of previous magnitudes in some areas, flood could still occur in the Manhattan area.[48] There are two examples of possible future floods: the Intermediate Regional Flood and the Regional Flood. A Regional Flood represents a practical ceiling for expected flood levels, though it is meterologically possible for even greater floods to occur. An Intermediate Flood signifies floods that may be expected more often.

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[47]Corps of Engineers, U.S. Army, Kansas City District, Floodplain Information: Kansas and Big Blue Rivers, Manhattan, Kansas, May 1972, p. 14.

[48]Ibid.

The Intermediate Regional Flood is defined as a flood having an average frequency of occurrence in the order of once in one-hundred years, although the flood can occur in any year. The probability magnitudes of this type are usually developed from analysis of streamflow and precipitation records and the runoff typical of the river basin. The Intermediate Regional Flood discharge for the Kansas River at Manhattan is 220,000 cubic feet per second (c.f.s.) and for the Big Blue River is 35,000 c.f.s.

The Regional Flood is defined as a flood having an average frequency of occurrence on the order of once in 500 years, although this flood may also occur in any given year. The estimates employed to determine the Intermediate Regional Flood are also used in the determination of the Regional Flood. The Regional Flood discharge for the Kansas River is 250,000 c.f.s. and for the Big Blue River is 100,000 c.f.s.

The largest flood ever recorded in Manhattan occurred in 1951. Following two months of above normal precipitation, four straight days of extremely heavy rains fell over the

lower portion of the Kansas River basin. During this period, the Kansas River at Manhattan was above flood stage for a total of 47 days. The maximum gage height of 10.2 meters occurred during this time, with an estimated discharge of 300,000 cubic (c.f.s.) in the Kansas River and about 98,000 c.f.s. in the Big Blue.[49] (Scenes from past floods including the 1951 flood are shown in plates 1 through 6.) Accurate estimates of peak flows are useful in the evaluation of future flood hazards.

The Kansas River discharge of March 1960, which had an estimated discharge rate of 47,000 c.f.s. at the old sewage treatment plant gage has been ranked as a ten year frequency flood; that is a flood which, on the average, occurs every ten years. The values for the 25, 50, and 75 year floods are listed in Table 2.

Floods larger than the Regional are possible; although it is not likely that the combination of factor needed to

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[49]Corps of Engineers, op. cit., p. 15.



Plate 1. Poyntz Avenue in downtown Manhattan immediately after the 1951 flood.

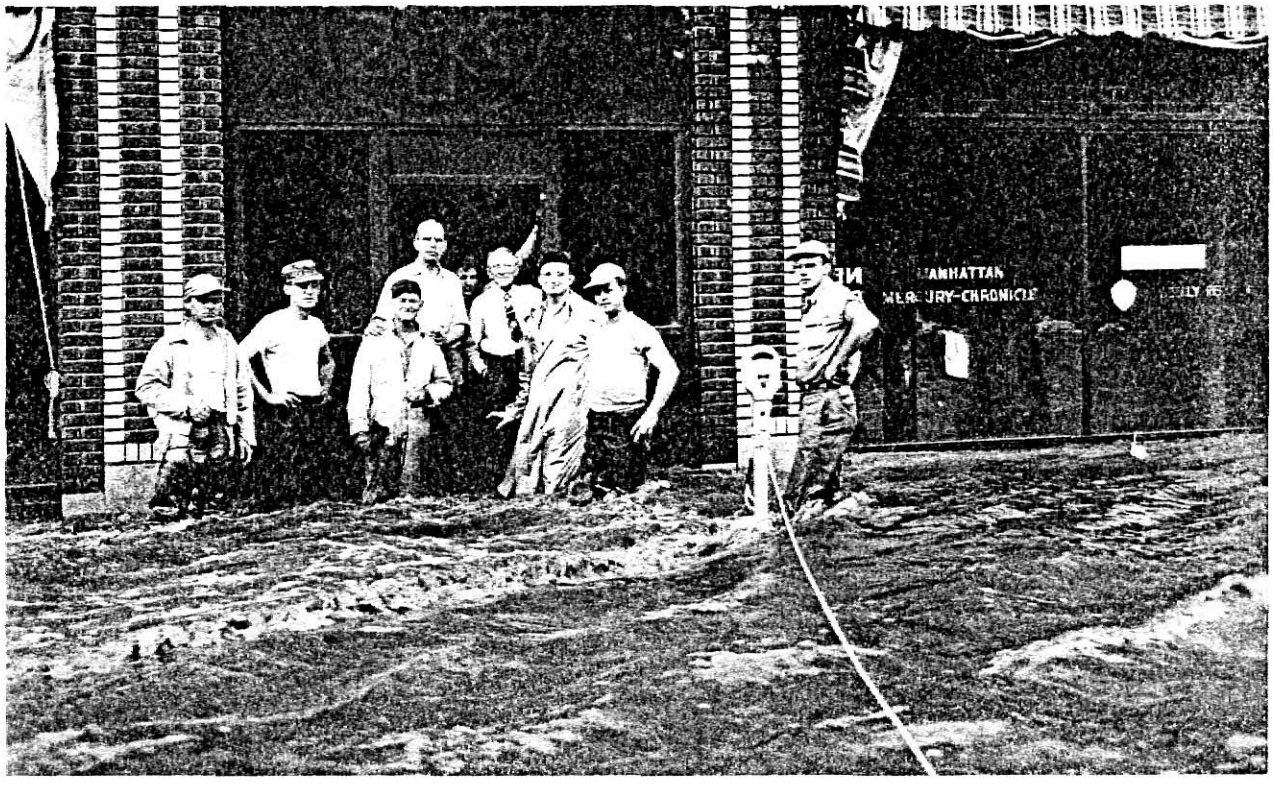


Plate 2. Vision of the turbulent flood waters on 4th Street in downtown Manhattan in 1951.



Plate 3. Scenes from inside a department store off Poyntz Ave. during the 1951 flood.

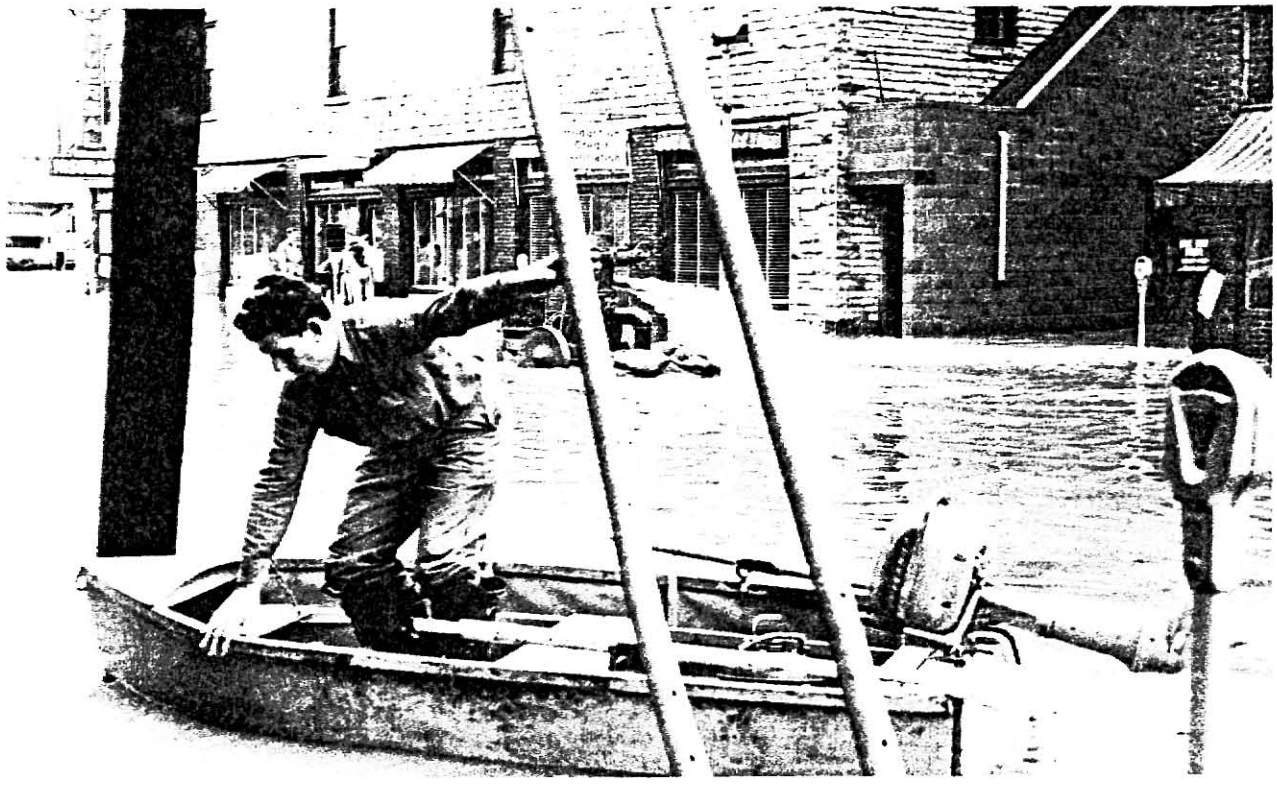


Plate 4. The scene on Third Street during the 1951 flood.

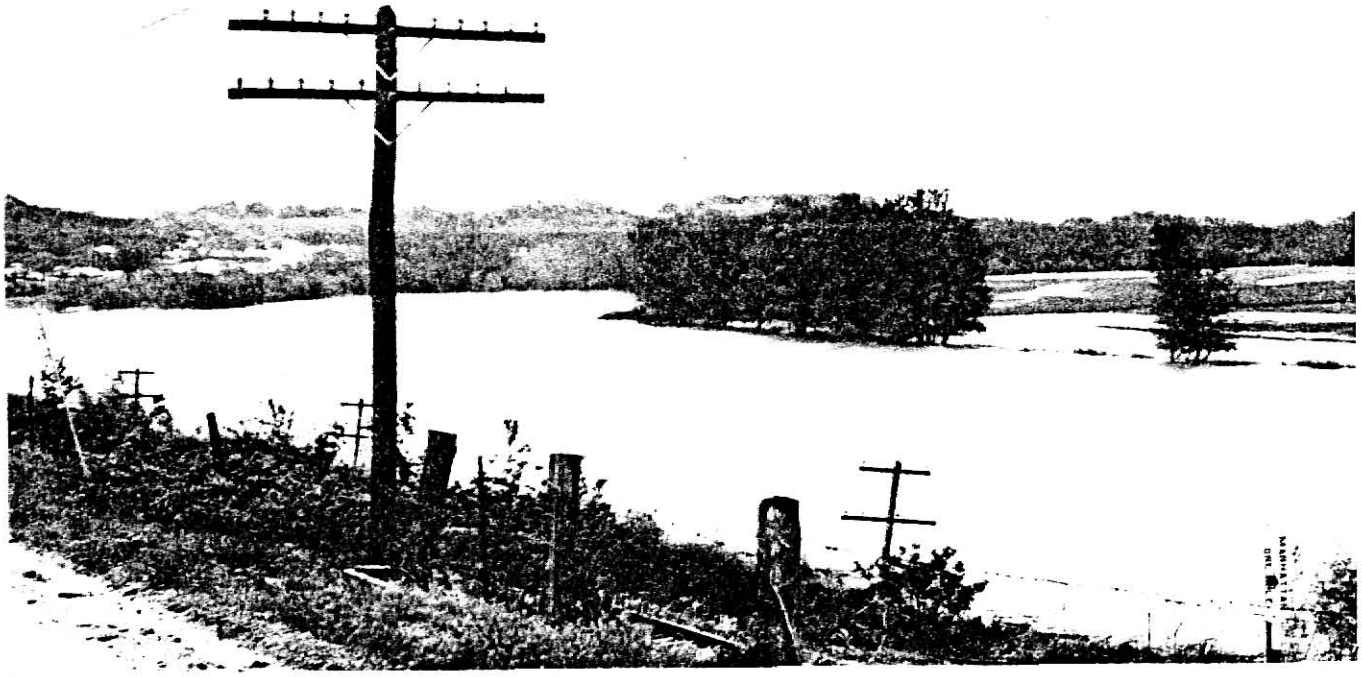


Plate 5. Flooding along the Wildcat Creek in 1951.



Plate 6. Receding flood waters on Hunter's Island.

TABLE 2

PEAK FLOWS FOR 25, 50, AND 75-YEAR FLOODS

Stream	Location	25-year Flood c.f.s.	50-year Flood c.f.s.	75-year Flood c.f.s.
Kansas River	Old Sewage Treatment Plant	75,000	100,000	125,000

(Source: Corps of Engineers, U.S. Army)

to produce such a calamity would occur. Consideration of potential floods of this type would, nonetheless, be important to perspective developers of the floodplains.

The hazards of life, health, and property which could result from an intermediate Regional or Regional flood occurring in the Manhattan vicinity is likely to affect and concern a large portion of the community. This would be especially true if the added pressure from flood waters caused the collapse of Tuttle Creek Dam. Flood levels in many existing residential and commercial areas would be high. Many problems such as rapidly rising and swiftly flowing flood waters would create hazards which would greatly burden all the local emergency units. Awareness of these

hazards would not noly benefit floodplain residents, but the entire community.

Statement of the Problem

This investigation examined perception and awareness of Manhattan residents in regard to flood hazards. In view of the number of floods which affect humans annually, knowledge of, awareness of, and response to hazard situations are needed. The major focus of this investigation is to illustrate the awareness of flood hazard in Manhattan, identify factor which influence response, and to determine the affects of past flood experience on response[50] to hazard-related questions.

Three study areas have been chosen from the Manhattan area on the basis of their exposure to floods. Using this criterion, the area selected for this investigation were:

1)Hunter's Island - highly exposed to floods

2)Wildcat Creek - slightly exposed to flood

3)Northview - protected from floods

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[50]Response, as it is used in this context throughtout this Thesis, refers to a person's reaction to the flood hazard.

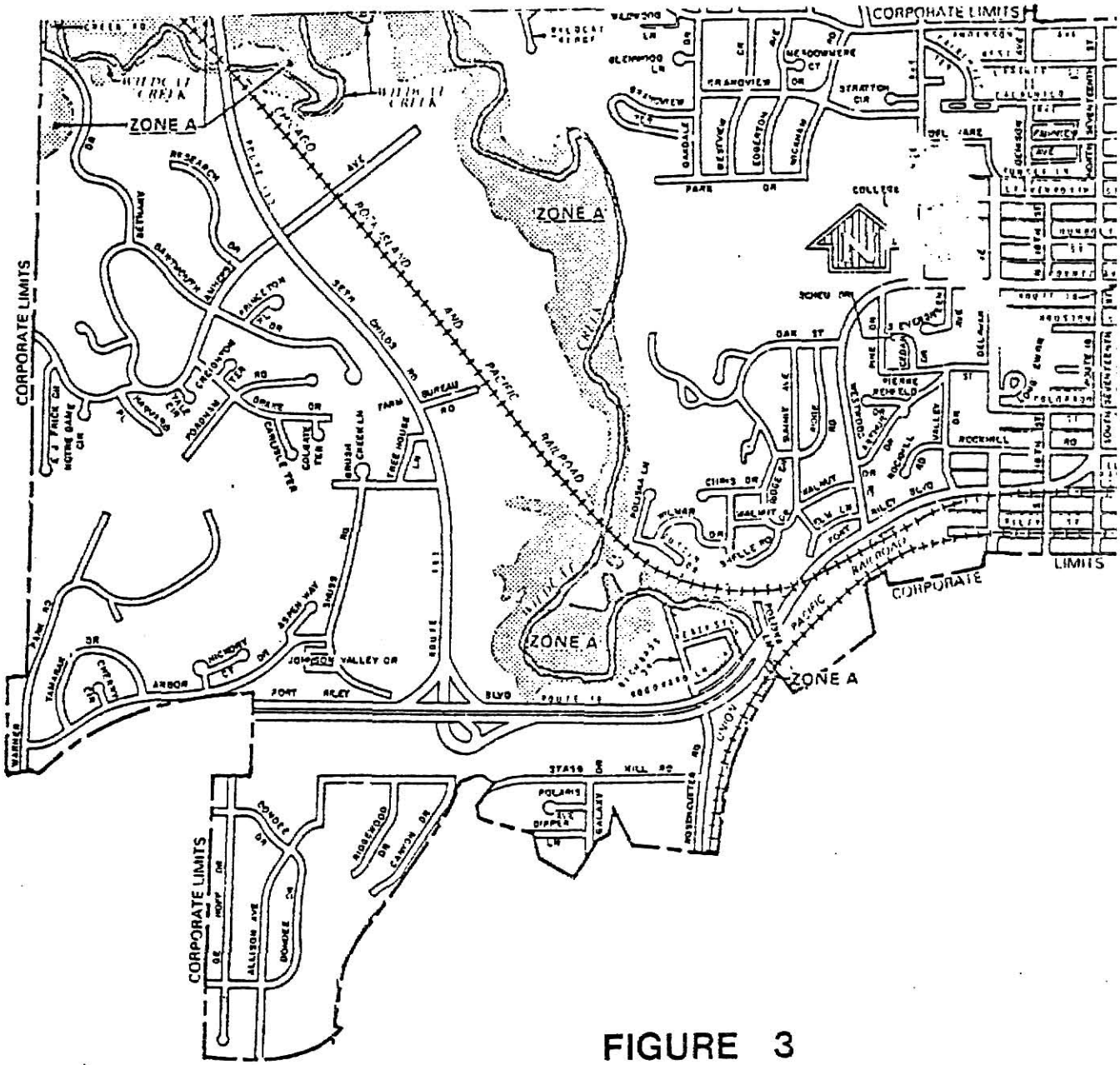
A preliminary assessment of the three study areas indicated that some homeowners, tenants and students are living in potentially hazardous zones, although these zones differ in degree of exposure to flood hazard. When referring to exposure, the issue is the degree in which a place is subjected to a given action or influence. Saying that a particular area is highly exposed to flood means that in the event of a Regional flood, that location would be highly subjected to inundation. Just the opposite would be true for areas with low exposure to floods.

Because of its position in the floodplain of the Kansas River and because it has no flood protection works, Hunter's Island has been classified as being highly exposed to floods. This area has frequently experienced wide-spread flooding. In fact, the incidence of flooding Hunter's Island has traditionally been the greatest in the Manhattan vicinity. This has led both the Army Corps of Engineers and community planners to categorize the area as extremely hazardous to human settlement. According to Corps of Engineer estimates,

all of the Hunter's Island study site would be inundated if a regional flood occurs along the Kansas River.

The Wildcat Creek study site has also experienced floods. Because of the smaller volume of water and area involved, this area is somewhat less exposed to floods than Hunter's Island. The flood hazard boundary shown is Figure 3 reveals that only a minute portion of populated areas fall in the hazard zone determined by the Federal Insurance Administration. However, with development intensifying within the city and rapidly expanding at its western fringe, the human exposure may eventually be greater in Wildcat Creek than in any other location in the Manhattan area.

The Northview study site, inversely, has little or no exposure to floods. This area is protected from floods by the Tuttle Creek Dam which has prevented floods originating from the Big Blue River. Much of Northview, however, is located in the floodplain of the Big Blue River and this fact seems to suggest a psychological effect on this community. For there is a remote possibility that the dam could one day collapse amidst heavy rainfall and flood waters.


CORPORATE LIMITS
ZONE A
ZONE A
ZONE A
ZONE A
CORPORATE LIMITS
CORPORATE LIMITS
CORPORATE LIMITS
RAILROAD
PACIFIC
FORT RILEY BLVD
ROUTE 18
ROUTE 177
ROUTE 177
ANDERSON CREEK
ANDERSON CREEK
ANDERSON CREEK

This study deals with a variety of correlations between the real and perceived environment. An individual's perceived environment is often influenced by a variety of extreme events, including floods. All of these occurrences have psychological consequences which lead to behavioral differences among various populations. Essential to people's decision-making processes, which are determined by behavior, is how their perceptions and choices affect their survival within the environment.

CHAPTER TWO

STUDY AREAS, SAMPLE, AND METHOD

An individual's perception of flood hazard is often influenced by the distinct characteristics of the immediate surroundings. These characteristics are responsible for the stimulation of senses from which people develop their attitudes and response behavior to potential hazard situations. Thus, it is important that there is comprehensive knowledge of the distinct character of each of the locations focused upon in this study. This chapter will discuss the physical and socio-economic conditions of each of the locations within the study area. It will also review the techniques used in the determination of perception.

The Study Area

For this study three sites, which have varied degrees of exposure to potential floods, were chosen from the Manhattan area. The areas, which have been labeled Northview, Wildcat Creek, and Hunter's Island, represent the study area and are shown in Figure 4. The three study sites were

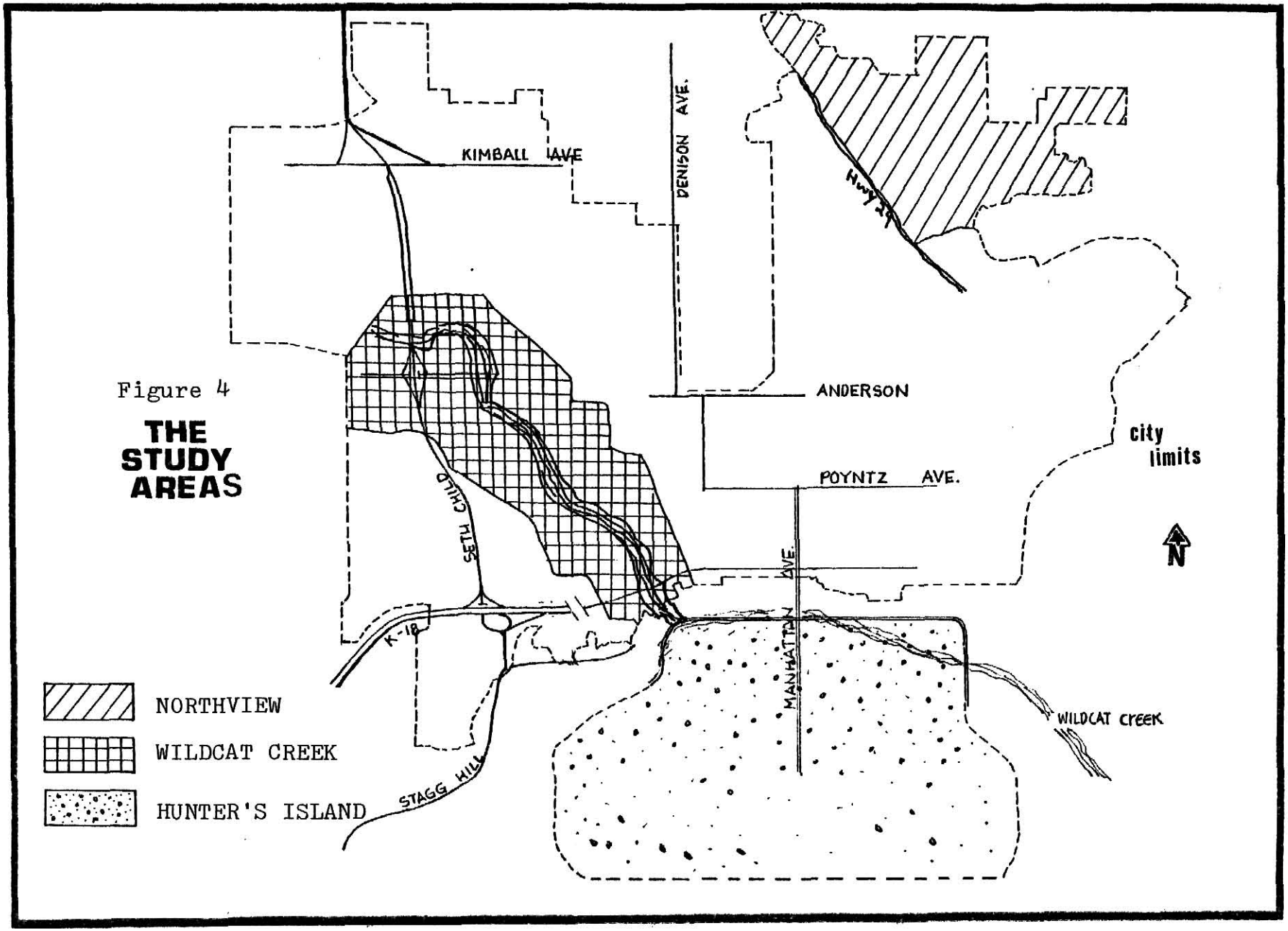


Figure 4

THE STUDY AREAS

selected on the basis of previous flooding in each of the areas and the data for potential flooding provided by the Army Corps of Engineers. Also considered in the site selection was the Flood Hazard Boundary Map of the city of Manhattan. Each study site is briefly described in terms of its character such as population, physical setting, and socio-economic standing.

Hunter's Island. The Hunter's Island study site is located south of Manhattan on the floodplain of the Kansas River. This area is sparsely populated and subject to periodic inundation by floods, making it unsuitable for urban development. However, the rich alluvial soils which exist in this tract make it prime agricultural land. Because of the flood hazard, community planners have recommended that Hunter's Island be limited to dwellings associated with agricultural activities. Nonetheless, a number of trailer courts have been developed in this territory. According to an agent of a local insurance firm, there are no more than 12 residents living on Hunter's Island that have flood insurance.[1]

[1]Personal interview with Dan Messelt, Charleston-Wilson Insurance Company, Manhattan, Kansas.

Commercial flood insurance is considered to be unaffordable and federally subsidized flood insurance has only recently (County obtained the necessary flood insurance rate map in November of 1979) become available to Hunter's Island residents.[2]

Because of the flood hazard on Hunter's Island, there is commercial or industrial development and in comparison to the other study sites, there is relatively little residential development. The flood hazard has also affected the value of property in that property here is valued much lower than that in the Wildcat Creek or Northview sites. An acre of land sells for roughly $2,900 per acre compared to approximately $3,700 per acre in the Wildcat Creek study site and a still greater amount in the Northview area where subdivisions have tremendously inflated the value of an acre of land.[3] The population on Hunter's Island is approximately 750. It is comprised of both life-long and short-term residents and military personnel.

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[2]Personal interview with an official of the Riley County Department of Planning and Zoning.

[3]This information was obtained from tax records provided by the Riley County Tax Appraiser's Office (Personal Property Department, Riley County Court House).

The greatest distinctions to be made between Hunter's Island and the other study sites are: 1) its physical exposure to flood, 2) the absence of commercial and industrial activity, 3) its location outside of the city limits, and 4) the importance of agriculture.

Wildcat Creek. The area designated as Wildcat Creek is located near the western boundary of Manhattan. This study site is dissected by the Wildcat Creek which originates some 28 miles (45 km) north of the city amidst the northern escarpment of the Flint Hills. It also serves as Manhattan's southern boundary, separating it from Hunter's Island. The north bank of Wildcat Creek within the city limits represents a floodplain which is occupied by considerable residential, commercial, and publicly owned development.

There appears to be a major growth thrust occurring in the Wildcat Creek study area to the west and northwest. Multifamily units, such as the University Gardens, southwest of the intersection of Highway K-113 and Anderson Avenue, are developing in this area. Adjacent to these housing additions are shopping areas, such as Westloop Shopping Center, located

near the intersection of Anderson Avenue and Highway K-113. Most of the light industrial activity developing in the Wildcat Creek floodplain is located along Amherst Avenue northwest of Seth Childs Road. There had been very little growth in the Wildcat Creek floodplain previously.

The social character of the Wildcat Creek study site is somewhat like that of the Hunter's Island study site. It too has a large portion of its residents living in trailer courts where there are families and students who are likely to be unable to afford the rising costs of land and new housing in adjacent areas.

Northview. The Northview study site is located in the extreme northeast corner of Manhattan, south of the Tuttle Creek Dam near the edge of the Big Blue River floodplain. The area is protected from floods by the Tuttle Creek Dam and by levee construction. The first residential development in this area began shortly after the 1951 flood. During this time, land prices here were among the lowest in the Manhattan area, approximately $500 per acre compared to $750 per acre on Hunter's Island.[4] However, after the completion of Tuttle

[4]Riley County Appraiser's Office.

Creek Dam in 1962, Northview experienced rapid residential growth. The subdivision of land by developers greatly increased the value of property in this area. Five acres (two hectares) of land which sold for $506 per acre in 1951 immediately after the flood, are now divided into 21 lots valued at $120,035.[5] The typical home in Northview ranges in value from 29 to 35 thousand dollars (estimated). The people who live here are low to moderate wage earners with family incomes averaging between between 15 and 18 thousand dollars.[6] Like residents of Hunter's Island and Wildcat Creek, many Northview residents are employed by Kansas State University and Fort Riley. Many residents in the vicinity are also employed by the nearby McCall Pattern Company.

There is very little commercial development in this area and no industrial development. However, this may change, since the Northview area has been selected for industrial growth in Manhattan, along with the Little Kitten area northwest of the city.

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[6]Marvin Butler, Director of Community Development, Manhattan, Kansas. Personal Communication (1979).

Study Method

In order to gather data concerning individual awareness and response to floods, some procedure should be established. In this study, the purpose of such a procedure is to establish an accurate means for securing pertinent information which is useful in measuring respondnet levels of awareness and response at each of the three locations being examined. The procedure used to obtain this information was to draw a sample from each location and to survey the members with a mailed questionnaire. The actual perception measurement will be presented in the next chapter.

The Sample. A random sample was drawn from each of the study sites in an effort to obtain an unbiased set of respondents from the population under consideration. This was accomplished by using a random numbers table to make selections from the local telephone directory. For example, if the random number obtained from the directory was 5, the fifth person on the page of the directory was selected providing that person was identified as living within one of the three locations under study. By using this process, an unbiased sample of the Manhattan

population could be obtained and specific addresses listed. It is possible however, that a number of people were excluded from this process as many poor people and transients from the Hunter's Island and Wildcat Creek study sites may not have had telephones. Nevertheless, this procedure eventually produced the names of 150 area residents, 50 from each study site. It was thought this number of participants would yield a suffient number of responses for measurement purposes. In order to obtain the responses needed for the determination of flood hazard awareness, a survey questionnaire was mailed. Each mailing included the survey, a cover letter explaining the purpose of the study, and a self-addressed stamped envelope to encourage their return. Table 3 shows the response rate of the survey.

TABLE 3
SURVEY RESPONSE RATE

Area	number sent	number received	percentage received
Northview	50	27	54
Wildcat Creek	50	21	42
Hunter's Island	50	17	34
Total	150	65	43

The variation in the response rate between the study areas might be explained by reflecting on the character of the individual study site populations. In doing so, a lower response rate might be expected for Hunter's Island and Wildcat Creek where there are higher percentages of poor and transient residents who may be less concerned about community related matters.

The survey response rate may have been influenced by the time at which it was issued. It was sent out during July of 1978, a time at which many residents are vacationing and the number of students at Kansas State University is about one-fourth that of the academic year. About 90 percent of the surveys completed were returned within two weeks of being distributed, suggesting that those who particpated showed some interest in the study. It was noted that the earliest responses came from the Hunter's Island and Northview study sites. Although the response rate (43 percent) appeared to be consistent with that of most research, it was thought that a greater response could be obtained. Thus, a follow-up post card was sent to each person chosen for the survey (see Appendix C). However, only two additional questionnaires were obtained through this effort, signifying that the questionnaire

had either been sent in, discarded, or lost. This result was suprising considering that 85 questionnaires were outstanding.

The Questionnaire. A properly designed questionnaire is considered an effective tool in measuring awareness of environment even though humans may not always be cognizant of their environment or competent enough to express its effect on them. Nevertheless, it is used in this study as a means of determining how humans perceive their environment. The dependent variable(s), or the measures of the degree of awareness of the respondents is manifested by their response to questions aimed at determining their knowledge of the existing flood hazard situation in Manhattan.

In composing a questionnaire to define human attitudes, one must insure that the questionnaire is applicable and that the answers appear in a form that is easily comprehensible. The ideas for devising a questionnaire for this study took form after reviewing A. N. Oppenheims'[7] discussions on attitude development and by studying Robert Kates' commercial survey,[8] which was used successfully in La Follette, Tennessee.

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[7]A. N. Oppenheim, Questionnaire Design and Attitude Measurement (New York: Basic Books, Inc., 1966), p. 106.

[8]Kates, Hazard and Choice Perception, pp. 145-151.

Oppenheim believed that an attitude was a state of readiness in which there is a tendency to act or react in a certain manner when one is confronted with a particular stimulus. He also stated that an attitude is not automatically demonstrated but becomes visible only when the object of the attitude is perceived.[9] Kates' commercial survey provided numerous illustrations of questions which help determine perception. The questions chosen for this study will be analyzed in the next chapter.

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[9]Oppenheim, op. cit., p. 34.

CHAPTER THREE
FLOOD HAZARD PERCEPTION IN MANHATTAN

In this chapter the survey results are examined to determine how the flood hazard is perceived in the three study sites. Four general subheadings will be used as a means of structuring the analysis of the more pertinent aspects of the survey data. The purpose for this division is to give a more effective illustration of the factors most associated with human awareness and response to flood hazard in Manhattan. The initial section reviews and discusses the survey responses and presents a tabulation of the results. In the second section consideration is given to each of the independent variables to determine their associations with differential attitudes toward the flood hazard in the sample population. Here the chi-square test is employed using a .05 significance level as method of illustrating those components which are confirmed to be related. The third section examines the factors associated with differences in flood hazard perception. This section will also employ the chi-square test as a means of determining

those variables which appear to influence responses that indicate how one perceives the flood hazard in Manhattan. In this section hazard-related variable crosstabulations will be considered for their influence on hazard perception. Finally, the fourth section will discuss the significance of experience in the perception of the flood hazard in Manhattan. In this section variable crosstabulations will be used to demonstrate the role of experience in the perception of flood hazard.

TABULATION OF THE SURVEY RESULTS

The purpose of this section is to report on the responses from the survey questionnaire. This was accomplished with the use of tables and by dividing the survey results into two categories: demographic characteristics and hazard-related variables.

Demographic Characteristics

The survey obtained information on eight demographic characteristics believed to have some relationship with hazard

perception. The variables selected for this category were: 1) respondent age; 2) education; 3) location; 4) ownership of home; 5) structure type; 6) length of residence at present residence; 7) length of residence in Manhattan; and 8) permanent or non-permanent residents.

The results of the survey indicated that the majority of the respondents were between the ages of 25 and 40, with a secondary cluster whose ages range between 41 and 60. Hunter's Island had the oldest sample population with respondents having an average age of 48.3 years, followed by Northview which had the second oldest population with respondents having an average age of 42.8 years and Wildcat Creek with 37.5 years. In a similar study, Sonnenfeld implied that age could be linked with the variation in the levels of perception and adaptation among arctic residents.[1] In the context of this study, the mean ages would indicate that the older survey population on Hunter's Island may vary from the survey population of Wildcat Creek in levels of hazard experience and awareness. Logan,

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[1]Joseph Sonnenfeld, "Environmental Perception and Adaptation," Environmental Perception and Behavior, ed. David Lowenthal (Chicago) University of Chicago, Department of Geography Research Paper No. 109, 1967.

for example, found that age was a highly significant variable in relating to a person's level of awareness and response to tornado hazard. He also discovered that there was a strong relationship between age and awareness and response in cities with past hazard experience.[2] However, these findings were not applicable in this study as age was not involved in any significant relationships with the other variables.

The remaining demographic characteristics indicated that a significant proportion of the respondents have lived in Manhattan and in their immediate neighborhoods less than five years; consider themselves permanent residents of Manhattan; live in frame houses; and owned their homes. The study also disclosed that there were differences in the educational attainment of the sample populations of Northview and Wildcat Creek compared to that of Hunter's Island. For example, of all the respondents identifying themselves as college graduates, 85% (23) lived in either the Northview or Wildcat Creek study sites. This was also true of all the respondents who had obtained advanced degrees. Only 23% (4) of the respondents

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[2]Brian Logan, Experience as a Factor in Tornado Awareness and Response Levels in Kansas (Unpublished Masters Thesis: Kansas State University, 1977).

Table 4

Demographic Characteristics of Sample Populations

Characteristic	Sample areas			Total sample
	HI	WC	NO	
Total response	17	21	27	65
AGE				
less than 25...	4	5	2	11
25-40.....	5	8	13	21
41-60.....	2	7	10	19
over 60.....	6	1	2	9
HOME OWNERSHIP				
Owner.....	17	13	24	54
Renter.....	0	8	3	11
EDUCATION				
high sch. or vocational sch.	13	3	11	27
college grad...	4	13	10	27
post graduate..	0	5	6	11
PERMANENT RESIDENTS				
yes.....	16	15	25	56
no.....	1	6	2	9
LENGTH OF RESIDENCE IN MANHATTAN (years)				
less than 5....	2	8	9	19
5-10.....	5	5	4	14
11-15.....	3	5	4	12
16-20.....	1	0	4	5
over 20.....	6	3	6	15
LENGTH OF RESIDENCE IN NEIGHBORHOOD (years)				
less than 5....	8	16	16	40
5-10.....	5	2	2	9
11-15.....	1	3	8	12
16-20.....	0	0	1	1
over 20.....	3	0	0	3
STRUCTURE TYPE				
frame.....	2	8	19	29
brick.....	2	5	8	15
mobile home....	13	4	0	17

living in the Hunter's Island study site were college graduates. The demographic characteristics are summarized in Table 4. The relationship between these demographic features and hazard perception is discussed in a subsequent section.

Hazard-Related Variables

The majority of the questions contained in the survey questionnaire solicited responses directly pertaining to the flood hazard in Manhattan. Thus, these responses signify the hazard-related variables. The survey results provided hazard-related variables which were thought to illustrate the respondents perception of the flood hazard.

Perception of the flood hazard potential. Respondents were asked how they viewed the flood hazard potential in Manhattan. The intent of this question was to serve as an important indicator of risk perception. This question was asked because it was thought that a person who lived in a hazardous area does so by assuming some amount of risk. For this question respondents were given the choice of four answers. These were: not serious, somewhat of a threat, serious, and don't know. The same question was asked in reference to flood hazard in their immediate neighborhoods. The results are summarized in Tables

5 and 6. Table 5 shows that 58.5% (38) of the respondents believe that floods pose somewhat of a threat to Manhattan, wile 33.8% (22) indicated that the threat of floods in Manhattan was not serious. Most of the respondents in the Hunter's Island and Wildcat Creek sites saw floods as somewhat of a threat to Manhattan, with respondents in Northview being almost equally divided in giving either of these two responses.

TABLE 5

PERCEIVED FLOOD HAZARD POTENTIAL IN MANHATTAN

Perception	Sample areas			Total Sample
	HI	WC	NO	
Not serious	5 (29.3%)	5 (23.8%)	12 (44.4%)	22 (33.8%)
Somewhat of a threat	11 (64.7%)	14 (66.7%)	13 (48.1%)	38 (58.5%)
Serious	0 (0.0%)	0 (0.0%)	1 (3.7%)	1 (1.5%)
Don't Know	1 (5.9%)	2 (9.5%)	1 (3.7%)	4 (6.2%)

Table 6 reveals that when asked about the hazard potential in their immediate neighborhoods, 44.6% of the respondents said

the hazard potential was somewhat of a threat, while 43.1% (28) said it was not serious. It is notable that only in the Hunter's Island study site did more respondents see floods in Manhattan as somewhat of a threat rather than not serious as in the other study sites. It should also be noted that 80% of the people who indicated that the flood hazard was serious also lived on Hunter's Island.

TABLE 6

PERCEIVED FLOOD HAZARD POTENTIAL IN THE IMMEDIATE NEIGHBORHOOD

Perception	Sample area			Total sample
	HI	WC	NO	
Not serious ...	5 (29.4%)	10 (47.6%)	13 (48.1%)	28 (43.1%)
Somewhat of a threat .....:	8 (47.1%)	9 (42.9%)	12 (44.4%)	29 (44.6%)
Serious	4 (23.5%)	0 (0.0%)	1 (3.7%)	5 (7.7%)
Don't Know	0 (0.0%)	2 (9.5%)	1 (3.7%)	3 (4.6%)

In reality, the "somewhat of a threat" appears to be the most accurate of the choices depicting the potential flood hazard in the Manhattan study area. Considering the

variations in exposure of the three study sites, the rationale for this assessment is due to the history of flood occurances in the Manhattan area. Although there are a number of protection works in the study area, it has been shown that such protective structures are not infalable in defensing urban areas from floods. As indicated in Chapter one, floods are possible which could subject the entire study area to inundation.

In view of the responses given, it would appear that most of the respondents have an accurate appraisal of the actual flood hazard potential of Manhattan and their neighborhoods. This assessment was make subsequent to comparisons of the responses with the actual risk associated with each of the study sites. Consequently, the Hunter's Island respondents appear slightly more aware of the actual flood hazard in that their responses seem to reflect more the area's exposure to floods. Wildcat Creek respondents also appeared to be aware of the potential flood hazard as they too were likely to respond correctly to the hazard-related questions. However, it was anticipated that more respondents would list the flood potential here as somewhat of a threat due to its floodplain location.

The Northview respondents also demonstrated a high level of awareness of the actual flood hazard, although respondents were divided as to whether the flood hazard potential was not serious or somewhat of a threat to Manhattan or to their own neighborhood.

Experiencing a flood in Manhattan. Respondents were asked two questions concerning their past flood experience. The first question asked if the respondent was affected by the flood of 1951, whereas the second question inquired whether the respondent had experienced a flood while living in the study area. The primary intent of these two questions was to explore the hypothesis that those who have previously experienced a flood will be more aware of the hazard, and thus, more likely to make some adjustments to protect property. The response to the first question revealed that very few respondents were affected by the 1951 flood. However, in regards to the second question, Table 7 indicates that 41.5% (27) of the respondents had experienced a flood while living in Manhattan. As anticipated because of its exposure to floods, the Hunter's Island study site contained the highest percentage of the respondents

experiencing a flood. The responses obtained from the Wildcat Creek and Northview study areas also appeared to correspond with their respective levels of exposure to floods. In sum, these findings appear to indicate that if an individual lived in either the Hunter's Island or the Wildcat Creek study areas, he/she would be more likely to have experienced some type of flooding. This relationship (according to the chi-square crosstabulation) between location and experiencing floods in Manhattan was found to be statistically significant at the .01 level (probability level of once every hundred times). Therefore, in consideration of their flood experience, it would appear that the subjects living in the forementioned areas should have a high level of hazard awareness.

TABLE 7

RESPONDENTS EXPERIENCING FLOODS IN MANHATTAN

Response	Sample areas			Total sample
	HI	WC	NO	
yes	12 (44.4%)	9 (33.3%)	6 (22.2%)	27 (41.5%)
no	5 (13.2%)	12 (31.6%)	21 (55.3%)	38 (58.5%)

Estimating the number of past floods. Respondents were also asked to estimate the number of damaging floods (floods causing considerable property damage) that have occurred in the Manhattan area in the past ten years. This question was included as a measure of the respondent's knowledge of past flooding. As shown in Table 8, almost 74 per cent of the respondents believed that between one and three damaging floods had occurred in the Manhattan area in the past ten years, while 15.4 per cent (10) said that no damaging floods had occurred in Manhattan over the past ten years. In reality, two damaging floods occurred in the study area over the past decade. However, these floods were confined to portions of Hunter's Island and to areas along the Wildcat Creek floodplain as they took place in 1970 and 1977 respectively. According to the definition of a flood given in chapter one, it is possible that many more floods have occurred in the study during this time, but were of such magnitude as to go unnoticed. The floods of 1970 and 1977 were the only ones occurring in the past ten years which could be classified as damaging. Consequently, those respondents living in either Wildcat Creek or

Hunter's Island study sites indicating that between one and three damaging floods had occurred in the past ten years were correct, and although little or no flooding had occurred in the Northview study area since 1960, it can be readily seen that a significant proportion of the Northview respondents were also aware that between one and three damaging floods had occurred in the Manhattan area. The five residents in the Hunter's Island study site who remember no flood occurrances in the past ten years may be among those now in residense who were not present at the time of these floods.

TABLE 8

NUMBER OF FLOODS PERCEIVED TO HAVE OCCURRED IN MANHATTAN IN THE PAST TEN YEARS

Response	Sample areas			Total sample
	HI	WC	NO	
none	5 (50.0%)	2 (20.0%)	3 (30.0%)	10 (15.4%)
1-3	11 (22.9%)	19 (39.6%)	18 (37.5%)	48 (73.8%)
over ten	1 (33.3%)	0 (0.0%)	2 (66.7%)	3 (4.6%)
don't know	0 (0.0%)	0 0.0%)	4 (100.0%)	4 (6.2%)

Knowledge of flood insurance. Another indicator of awareness was believed to be the respondent's knowledge of whether their property was protected from the costs of damage by flood insurance. It was thought that if a respondent was aware of or perceived an existing flood hazard in his/her location, there would be some knowledge of personal flood insurance protection. Accordingly, each respondent was asked if they knew whether they had flood insurance. If the foregoing assumption is correct, then, the survey results indicate a somewhat low level of hazard awareness as the greatest number of respondents did not know whether or not their insurance protected them from flood losses. The responses are summarized in Table 9. It would be a good assumption that in reality, the majority of the respondents do not have flood insurance because of its high cost. Affordable federally subsidized flood insurance has only recently (within the last quarter of 1979) become available in the Manhattan area.

Suffering damage from floods. It was considered important to not only know if a respondent had experienced a flood event in Manhattan (or elsewhere), but also whether or not they had suffered any damage from a flood previously. A higher level of flood

hazard awareness was expected for those respondents who had suffered flood damage in the past. According to Kates,[2] there is evidence that monetary damages do affect the adoption of flood loss reduction alternatives, i.e., if a person were to experience a flood and suffer great monetary loss, he/she would be more likely to purchase flood insurance or take other preventative measures. As illustrated in Table 10, only 13.8 per cent (9) of the respondents had suffered any previous damage from floods in the Manhattan or elsewhere. The majority of the respondents who had suffered previous flood damage lived in the Hunter's Island study site, while none of the respondents within the Wildcat Creek study area have suffered any previous flood damage. These findings suggest that the population on Hunter's Island should have a greater awareness of the flood hazard.

Perception of damage from a major flood. As another measure of awareness, respondents were asked what they thought would be the extent of damage to their property in the event of a major flood. Respondents could choose one of these

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[2]Kates, op. cit., p. 133.

responses: none, minor, or great. The survey results indicate that 52.3 per cent (34) of the respondents believed that damage to their property resulting from a major area flood would be great. This was especially true of respondents in the Hunter's Island and Northview study sites, whereas the majority of those respondents in the Wildcat Creek study site indicated that there would be no damage to their property. Obviously, because of its exposure to floods, the Hunter's Island study area would likely experience wide-spread flood damage. On the other hand, the Northview study area has very little exposure to floods. Consequently, unless a major flood causes the collapse of the Tuttle Creek Dam, as implied in Chapter Two, or tops the levee construction at its southern boundary, damage to this area would be minimal. Perhaps the poor drainage in the area explains why the Northview respondents believe damage from a major flood will be great in that area. The Wildcat Creek respondents, in indicating that there would be no damage to their property, also appear to be unaware of the actual flood hazard potential in their location. Since these respondents live in or near the Wildcat Creek

TABLE 9

RESPONDENTS HAVING KOWLEDGE OF THE EXISTENCE OF FLOOD INSURANCE

Response	Sample areas			Total sample
	HI	WC	NO	
yes	7 (24.1%)	11 (37.9%)	11 (37.9%)	29 (44.6%)
no	10 (27.8%)	10 (27.8%)	16 (44.4%)	36 (55.4%)

TABLE 10

RESPONDENTS SUFFERING PREVIOUS DAMAGE FROM FLOODS

Response	Sample areas			Total sample
	HI	WC	NO	
yes	6 (66.7%)	0 (0.0%)	3 (33.3%)	9 (13.8%)
no	11 (19.6%)	21 (37.5%)	24 (42.9%)	56 (86.2%)

floodplain, it is possible that many would suffer substantial damage in a major flood.

Considering the flood hazard in residential selection. It was thought that the respondent's perception of flood hazard might be reflected in their residential selection. To determine if flood hazard perception was related to residential selection, respondents were asked if they considered the flood hazard in selecting their place of residence. The responses to this question are summarized in Table 11. It can be seen here that of the three study sites, Hunter's Island had the lowest percentage of respondents who had considered the potential flood hazard in their residential selection. This could suggest that a large number of the respondents in the Hunter's Island study area were unaware of the flood hazard potential at the time of residential selection or that respondents are living here on a temporary basis and felt that the likelihood of a flood occurring during their tenure would not be great. It was revealed in Chapter Two that there was a significant number of soldiers (short-term residents) living in this area. Therefore, it is also possible that many of

these people may have dismissed the hazard potential of the area because of economic reasons or because of the shortage of housing for low and middle income earners in Manhattan. Furthermore, it is possible that the geographical area from which they came had no exposure to floods or that they are indeed unfamiliar with the history of flood occurrences in this area.

TABLE 11
FLOOD HAZARD CONSIDERATION IN RESIDENTIAL SELECTION

Response	Sample areas			Total sample
	HI	WC	NO	
yes	5 (16.1%)	11 (35.5%)	15 (48.4%)	31 (47.7%)
no.....	12 (35.3%)	10 (29.4%)	12 (35.3%)	34 (52.3%)

Areas felt to have high flood hazard potential. Again, it was thought that a respondent's perception might be indicated by reviewing the areas selected as being highly flood hazardous by the respondents. Thus, each respondent was asked to pick from a list of Manhattan locations, the areas

they felt to be most flood hazardous. As an indicator of awareness, each respondent's selection could be weighed against the actual hazard potential of the places chosen. The results illustrated in Table 12 reveal that Hunter's Island was the location perceived to be the most flood hazardous area. It can also be seen that Poyntz Avenue was the perceived to be the least flood hazardous. These responses appear to indicate a high level of awareness by the respondents in that they are highly correlated with the actual hazard potential of each location. For example, Poyntz Avenue (see Plate 1), which was covered by three to four feet of water during the 1951 flood, is now protected by levee construction and has a very low flood hazard potential.

Making adjustments to floods. It was also thought that a respondent's perception of an existing flood hazard might be indicated by the flood mitigating adjustment he/she made to protect their property from flood damage. Thus, the respondents were asked questions which would indicate the adjustments perceived necessary to provide protection from floods. If a respondent did not believe floods to be hazardous, it would be unlikely that any adjustments to floods will be made. The

survey results indicated that only 21.5 per cent (14) of the respondent made some adjustments for floods and that only 20 per cent (13) believed that some adjustments could be made to protect their property from flood damage. The Hunter's Island study had the highest percentage of respondents making some adjustment for flood damage (29%) followed by Wildcat Creek (19%) and Northview (18.%). The implication here appears to be that the respondents on Hunter's Island may have perceived floods to represent a greater hazard than did the respondents in the other study areas.

TABLE 12
AREAS SELECTED FOR HAVING HIGH FLOOD HAZARD POTENTIAL
(number indicating area was highly hazardous)

Area Selection	Sample areas			Total sample	per cent of the total sample
	HI	WC	NO		
Hunter's Island	15	15	20	50	76.9%
Wildcat Creek	13	15	18	46	70.8%
Third Street	10	11	17	38	58.5%
Northview	0	3	11	14	21.5%
Poyntz	2	3	2	7	10.8%

Previously moved because of flood. Respondents were asked they previously changed residencies because of a flood. It was thought that prior flood experience would make a respondent more aware of flood hazardous conditions. The number of respondents in each study site who had previously moved because of a flood is shown in Table 13. It can be seen here that only a small percentage of the sample population had moved previously due to a flood(s). The greatest number of those respondents who had moved because of a flood lived in the Northview study area. However, there was no significant statistical difference between the three study sites.

TABLE 13
RESPONDENTS WHO HAD MOVED PREVIOUSLY BECAUSE OF A FLOOD

Response	Sample areas			Total sample
	HI	WC	NO	
yes	3 (33.3%)	1 (11.1%)	5 (55.6%)	9 (13.8%)
no	14 (25.0%)	20 (35.7%)	22 (39.3%)	56 (86.2%)

The foregoing analysis identified a number of interesting factors pertaining to hazard awareness, hazard experience, and hazard mitigation in relation to the variables chosen for this study. With the exception of hazard mitigation, these will be discussed further in subsequent sections. The next section, however, will look only at the independent (demographic) variables in determining their statistical significance.

Analysis of the Independent Variables For Statistical Significance

Eight independent variables were selected for the purpose of this analysis: age, location, ownership, length of residence in Manhattan, length of residence in the immediate neighborhood, permanent residents, structure type, and education. These variables were postulated on the basis of those used in similar hazard studies pertaining to various types of natural hazards and on some initiated by the author. The purpose of this section is to determine whether there is a statistical significance between these variables and a specific response to one of the questions selected from the survey questionnaire. This question will relate directly to the flood hazard in

Manhattan.

Previous studies pertaining to environmental perception have shown importance of weighing the components which influence perceptions and attitudes. Sewell for example, in studying the perceptions and attitudes of engineers and public health officials who intended to be most aware of deteriorating environmental conditions, and most skeptical about the ability of present administrative arrangements and policies to improve these conditions.[3]

Joseph Sonnenfeld, in this study of environmental perception and adaptation levels in the Arctic stressed that there were many factors that condition the sensing and perception of the environmental stimuli. He also found that:

> these same factors also influence adaptation level, just as adaptation level subsequently influences perception. In any environment, for example, a variety of background stimuli will condition the perception of the focal stimulus: a given relief feature is perceived as more or less rugged according to the surrounding terrain; a given temperature or weather condition is perceived as more or less extreme according to the season of occurrence.[4]

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[3]W.R. Derrick Sewell, "Environmental Perceptions and Attitudes of Engineers and Public Health Officials," Paper Presented at the Annual Meeting of the American Psychological Association, Miami Beach, Florida, September 5, 1970.

[4]Sonnenfeld, op. cit., p. 52.

Similar to this study, Sonnenfeld emphasized variables such as location, environmental experience, and age while illustrating their significance in affecting perception and adaptation.

The remainder of this section will attempt to isolate those factors which affect perception of the flood hazard in Manhattan, Kansas. To accomplish this, one question was selected from the survey questionnaire and examined for its significance after crosstabulations with the independent variables were performed. The question used for this examination was: "How do you view the flood hazard potential in Manhattan?"

Method. Question 7 inquired about how each respondent viewed the flood hazard potential in Manhattan and in their immediate neighborhood. The question was chosen because it was considered the best indicator of flood hazard perception in Manhattan as it illustrated flood hazard awareness. Let us examine the results of the cross-tabulation.

Results. Results of the tests of significance are indicated in Table 14. No relationship was found to exist between any of the independent variables on responses to the question

TABLE 14

SUMMARY OF THE TESTS FOR STATISTICAL SIGNIFICANCE OF THE INDEPENDENT VARIABLES WITH RESPONSES TO QUESTION 7*

INDEPENDENT VARIABLE			
Age	chi-square	8.9	not significant at .05 level
Location	chi-square	4.2	not significant at .05 level
Ownership	chi-square	1.8	not significant at .05 level
Length of Residence in Manhattan	chi-square	11.8	not significant at .05 level
Length of Residence in immediate Neighborhood	chi-square	11.4	not significant at .05 level
Structure Type	chi-square	3.9	not significant at .05 level
Permanent Resident	chi-square	1.3	not significant at .05 level
Education	chi-square	11.2	not significant at .05 level

*Question: "How do you view the flood hazard potential in Manhattan?"

**Education was the most significant independent variable as it was significant at the .08 level. None of the other variables were significant below .4.

tested. This implied that there was no statistical significance between the pattern of responses and any of the independent variables previously identified. However, by using the chi-square test it was determined that of the variables tested, education was the most significant in determining response to Question 7. This suggests that education influences individual response to flood hazard in Manhattan. To insure that these findings were applicable to other attitudes, identical tests were performed using other questions from the questionnaire. Consequently, it was established that there was a highly significant relationship between location and the questions pertaining to: 1) suffering damage from a flood, 2) experiencing floods in Manhattan, and 3) individual perceptions of flooding (see questions 11, 12 and 15 in Appendix B).

This inquiry has sought to establish the influence of some of the variables depicted in this chapter on hazard perception. Although most of the variables were not found to be significant in influencing response, such variables are often important in the interpretation of perception. The next section will concentrate solely on those factors which are

identified in this study as factors associated with differences in attitudes towards the flood hazard.

Factors Associated with Differences in Flood Hazard Perception

The following is a summary of those variables (both independent and dependent) which appear to be linked to differences in hazard perception. All variables were selected on the basis of their being statistically significant at the .05 level. By using this criterion, the significant variable relationships could be identified. These relationships are summarized in Tables 15 and 16. Table 15 shows that a significant relationship exists between location and an individual's perception of flood damage, and between suffering damage from floods. These relationships might be anticipated if location in either of the areas depicted in this study represents a different degree of hazard. This being the case, we could assume that there is some degree of awareness among the respondents.

Other variables influencing survey response. A review of the hazard-related variable cross-tabulations revealed that there are other variables affecting survey response in the

Table 15

SIGNIFICANT VARIABLE RELATIONSHIPS

DEMOGRAPHIC VARIABLES									
AGE	LOCATION	LGTH. RES. IN MAN.	LGTH. RES. IN NH.	OWNERSHIP	PERMANENT RES.	STRUCTURE TYPE	EDUCATION		
0	0	0	0	0	0	0	0	Hazard Potential/ Mn.	HAZARD - RELATED VARIABLES
0	0	0	0	0	0	0	0	Hazard Potential/ Nh.	
0	0	0	0	0	0	0	0	Perceived floods/10yr	
0	X	0	0	0	0	0	0	Experiencing flood	
0	X	0	0	0	0	0	0	Suffered Damage	
0	0	0	0	0	0	0	0	Knew of Insurance	
0	0	0	0	0	0	0	0	Considered hazard	
0	0	0	0	0	0	0	0	Adjustments	
0	0	0	0	0	0	0	0	Other Adjustments	
0	0	0	0	0	0	0	0	Previously moved/ fld.	
0	X	0	0	0	0	0	0	Perceived damage/ fld.	

X - Relationship is significant

0 - Relationship is not significant

study area. The first relationship exposed was that there was an association between respondents who had previously moved because of floods and knowledge of the number of floods which have taken place in Manhattan in the past ten years. This implies that those who had been forced to move previously because of floods are likely to be cognizant of the occurrance of flood events.

Previous movement because of floods was also linked with other responses. The variable crosstabulations indicate that if a respondent had previously moved because of a flood, that respondent indicated having experienced flood while living in Manhattan. The relationship between these two variables was significant at the .01 level. This would indicate that such an individual would have experienced a significant amount of flooding in Manhattan and would have a high level of flood awareness based on previous experience. It was also found as could be expected, that if a respondent had previously moved because of flood, that respondent was likely to have suffered property damage from the flood. This suggests that prior movement may have been necessary because of the amount

of damage to property sustained and that a respondent could as a result, have developed a greater awareness of flood hazard. Since most of the respondents who have suffered previous damage from floods live on Hunter's Island, it is possible that many of the residents who live here are aware of flood hazard, but endure the risks associated with their location because of economic or other reasons.

A highly significant relationship also exists between experiencing floods while living in Manhattan and considering the flood hazard in residential selection. Fifty-five per cent of the respondents who had experienced floods while living Manhattan did not consider the flood hazard in choosing a place to live. This could mean that most of the respondents do not believe the flood hazard in the Manhattan area to be substantial enough to warrant any special consideration in residential location. Also, there was a highly significant relationship between experiencing floods while living in Manhattan and the selection of the Wildcat Creek study site as an area with high flood hazard potential. This could be taken to mean that if one had experienced floods in Manhattan, the

person may have received that experience in the Wildcat Creek vicinity.

Significance of Experience in Flood Hazard Perception

This section seeks to determine the importance of past flood hazard experience in the perception of flood hazard. It is evident in the literature addressing natural hazard management that previous hazard experience has frequently been considered a valuable, although obscure, influence on perception and hazard awareness. White, for example states:

> The flood hazard is underestimated by most flood-plain dwellers because of the infrequency of major floods, the fraileties of human memory, and the reluctance of some people, for economic reasons or from sheer obstinacy, to admit that past floods may be repeated or exceeded ... As a general rule, the flood hazard tends to wax and wane in the public mind in direct relation to the occurance of high water.[5]

Other researchers have explored this relationship and, at present, there seems to be some conflict in the findings regarding experience. Baumann and Sims for example, examined response to the threat of hurricane and concluded:

> It is clear that neither awareness of the existance of the hurricane hazard nor indeed past experience with it, are sufficient to produce effect-precautionary action.[6]

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[5] White, Human Adjsutments to floods, p. 51.

[6] D. Baumann and J. Simms, "Human Response to Hurricanes," Natural Hazards Local, National, and Global, Gilbert White, ed. New York: Oxford University Press, 1974.

Because of the inconsistencies that exist in past research and in order to test such a relationship in Manhattan, variables were chosen from the questionnaire which were associated with prior flood hazard experience. These variables were then crosstabulated with selected hazard-related variables to determine their significance in affecting responses. The variables involved in the crosstabulation are: 1) experiencing floods while living in Manhattan, 2) suffered previous damage from flood, and 3) previously moved because of a flood. A fourth experience variable was omitted from all crosstabulations because it concerned less than two per cent of the sample population. This variable pertained to those affected by the 1951 flood. The results are shown in table 16. It can be seen here that there significant relationships between the perception of flood damage and knowledge of flood insurance; considering the flood hazard in residential selection and experiencing floods in Manhattan; and respondents who have moved previously because of floods and experiencing floods in Manhattan. The first relationship implies that if a respondent perceived property damage from floods to be

Table 16

SIGNIFICANT VARIABLE RELATIONSHIPS

HARZARD - RELATED VARIABLES												
HAZARD POTENTIAL/ MN.	HAZARD POTENTIAL/ NH.	PERCEIVED FLOODS/NO.	EXPERIENCING FLOOD	SUFFERED DAMAGE	KNEW OF INSURANCE	CONSIDERED HAZARD	ADJUSTMENTS	OTHER ADJUSTMENTS	PREVIOUSLY MOVED	PERCEIVED DAMAGE		
0	0	0	0	0	0	0	0	0	0	0	HAZARD POTENTIAL/ MN.	HAZARD - RELATED VARIABLES
0	0	0	0	0	0	0	0	0	0	0	HAZARD POTENTIAL/ NH.	
0	0	0	0	0	0	0	0	0	0	0	PERCEIVED FLOODS/NO.	
0	0	0	0	0	0	0	0	0	0	0	EXPERIENCING FLOOD/ MN.	
0	0	0	0	0	0	0	0	0	0	0	SUFFERED DAMAGE	
0	0	0	0	0	0	0	0	0	0	X	KNEW OF INSURANCE	
0	0	0	X	0	0	0	0	0	0	0	CONSIDERED HAZARD	
0	0	0	0	0	0	0	0	0	0	0	ADJUSTMENTS	
0	0	0	0	0	0	0	0	0	0	0	OTHER ADJUSTMENTS	
0	0	0	X	0	0	0	0	0	0	0	PREVIOUSLY MOVED	
0	0	0	0	0	0	0	0	0	0	0	PERCEIVED DAMAGE	

X - Relationship is significant

0 - Relationship not significant

great, he/she would be likely to have knowledge of flood insurance. The second relationship suggest that a person who has experienced floods while living in Manhattan would be likely to consider the flood hazard in residential selection. The last relationship reveals that a person in the study area who had experienced flood s while living in Manhattan had previously moved because of floods.

This chapter has illustrated how the respondents view the flood hazard in and around Manhattan, Kansas. It also has identified a number of variables which appear to influence response to this hazard. These finding will be discussed shortly in Chapter four. Before begining this discussion however, let us review some of the limitation of the study.

Limitations of the study

Near the completion of this study on hazard perception, it was realized that some limitations did exist which might affect the meaningfulness of these results. The first limitation was that a larger sample should have been obtained. This could likely have been accomplish by sending an additional survey with the follow-up post card. The survey response

Consequently, resulted in small numbers in each cell which may jeopardized meaningful analysis. Another limitation was the absense of a reliable instrument to measure awareness and experience. Such an instrument would have allowed for more clearer interpretations in these areas. One final limitation can be linked to the survey questionnaire. It is felt that some of the questions used did not yield the information originally sought. For example, the question regarding knowledge of flood insurance could easily be misinterpreted to ask whether or not the respondent had flood insurance. Despite these limitations, it is believed that the findings of this study do illustrate a number of interesting relationships and attitudes pertaining to the flood hazard in Manhattan, Kansas. Some of these findings will be reviewed in the next chapter.

CHAPTER FOUR

CONCLUSIONS AND IMPLICATIONS

The primary goal of this study was to determine the perception and awareness of the flood hazard among Manhattan residents. It has been confirmed that the variables conveying previous personal experience with floods were the most important of the aggregate variables used in determining one's perception of flood hazard. Although there are a variety of other factors which account for an individual's perception and awareness of a given stimuli, none were more evident in this study than past hazard experience. Furthermore, a person's level of awareness can often times be measured by the intensity of one's response to a particular hazard. This awareness may be reflected by the respondent's view of the hazard situation, e.g., by contrasting the actual flood hazard against the perceived flood hazard.

It was found that experience exerts a strong influence on a person's perception of the flood hazard. The traumatic experience of a flood event and disaster situation can appear

to be associated with the harsh realities of this hazard, and subsequently modify one's perception and level of awareness. Therefore, those who had no previous flood experience would be expected to have a different attitude toward such a hazard. If prior flood damage is a component of the hazard experience, it is usually reflective in the individual's response when he/she is responding to the hazard related questions posed in this study. Thus, if a large number of the respondents had experienced the great flood of 1951, it would seem logical that higher levels of perceptiveness and awareness of flood hazard would be the result. Accordingly, the distance in reality between the actual and the perceived flood hazard would be smaller. Those citizens who acknowledge the flood hazard in Manhattan as being somewhat of a threat are seemingly the most cognizant of the survey population. If this is true of the entire population, the majority would realize the possibility of a hazardous flood event occurring in Manhattan despite the existing protective works. Should this level of perceptiveness and awareness persist, it might be expected that those affected will respond sufficiently to a flood emergency.

The primary finding of this thesis reveal that suffering damage from floods plays an important role in determining perception and awareness levels of the citizens who had experienced flood(s). The individual's attitude towards flood hazard was likely to be significantly altered after suffering some type of flood loss. However, the levels of perception and awareness may vary according to the magnitude of the loss(es) or due to the respondents prior flood experience.

Another significant relationship involved location. It appears that location also plays a role in determining perception and awareness. In this study those who lived in areas with greater exposure to flood appear to be slightly more aware of the hazardousness of their location. It was also found that Hunter's Island was perceived to be the most hazardous location in the study area.

Comparison with Previous Literature in Natural Hazards Studies

This study set out to test a variety of relationships which have previously been explored in the literature addressing natural hazards. A few of the significant findings lend support to previous work in perception of natural hazards.

The most important of these findings again pertained to the important of hazard experience. In Burton and Kates' study of floodplain dwellers and coastal residents it was indicated that experience is an important factor in determining individual perception of natural hazards. Here, the persons with more direct experience and those in areas more frequently affected appeared to be more perceptive than those with less experience, or those in areas where hazards occurred less frequently.[1] These factors were found to be important in this study as well, although it could not be reported that the frequency of floods was overly significant in Manhattan. Another similar finding was that social class and education were not significantly associated with perception. Thomas Saarinen, can be listed among those who have found that there is a relationship between the frequency of the natural event and perception of this hazard.[2] He too saw that greater experience tended to enhance individual hazard perception. In Waterstone's study dealing with flood hazard mitigation behavior, it was again

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[1]Burton and Kates, Natural Resources Journal, III, No. 3 (1964).

[2]Thomas Saarinen, Environmental Planning: Perception and Behavior, (Boston: Houghton Mifflin Co., 1976).

found that hazard experience was the most significant factor explaining the mitigation behavior of ploodplain residents.[3] Likewise, in Logan's study, experience was seen to be the significant of the variables determining levels of awareness and response to tornado hazard in three Kansas communities.[4]

Implication for Planning

Because of a long history of floods occurring in the Manhattan area, it is important that local planning be concerned with the formulation of emergency preparedness procedures, floodplain management, and in some instances, the removal of populations which may be vulnerable to future floods. To be successful in such planning efforts, it is important that local planning officials have prior knowledge of the attitudes and awareness levels of the citizens who may some day realize a flood hazard situation. For without this information, public officials and civil leaders would have no way of judging the effectiveness of warning systems and other precautionary measures which increase participation if

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[3]Marvin Waterstone, Hazard Mitigation Behavior of Flood Plain Residents, Institute of Behavioral Science Working Paper No. 35, (Boulder, Colorado), 1978.

[4]Logan, op. cit.

emergency procedure are required. This can be shown by posing a hypothetical situation regarding a natural hazard.

In the event of a standard project flood (500 year flood) occurring in Manhattan, some of the existing locations of human habitation would be affected -- notably Hunter's Island and Wildcat Creek. It is conceivable that some of the residents living in those areas would not recognize the course of events which would lead to the flood. It is also possible that these residents would not recognize, heed or even be aware of the warning which would preceed such an event. On the other hand, those who have experienced such previously would likely recognize these events and, therefore, be more responsive. It is important for the planner to know whether either or both of these conditions exist.

In view of such situations as may exist in Manhattan or other communities in or near floodplains, planning could someday be responsible for increased hazard mitigation. The urgency for such accomplishments thoughout Kansas and the United States as a Whole, warrant that all means be exhausted to this end.

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APPENDIXES

APPENDIX A

LETTER OF INTRODUCTION INCLUDED WITH THE MAIL QUESTIONNAIRE

July 10, 1978

Dear Participant:

I am currently engaged in a research project which concerns the perception of flood hazard in Manhattan, Kansas. This research is being conducted for my masters degree in geography at Kansas State University. I would greatly appreciate your help in filling out this short questionnaire.

My research is concerned primarily with the degree of awareness and attitudes of Manhattan residents concerning natural hazards. From the data that is received I also hope to see how awareness and attitudes vary in areas with different levels of exposure to these hazards. You are being asked to give vital information concerning your ideas with respect to natural hazards in Manhattan.

No specific identifying information is being asked of any respondent. You have been chosen randomly to participate in a sample of Manhattan residents. All information that you give will be handled anonomously. You may note that your name does not appear anywhere on the questionnaire, nor are you asked to identify yourself. It is important that you return the questionnaire by August 1, 1978, if at all possible.

Again, your cooperation in this endeavor will be greatly appreciated.

Sincerely,

Gerald Shanklin

APPENDIX B

SURVEY QUESTIONNAIRE USED IN THE STUDY OF PERCEPTION OF THE FLOOD HAZARD

1. Do you own your home? ____ Rent ____

2. Type of structure

   ____ mobile home ____ frame ____ brick ____ stone ____ other

3. Education (highest level achieved)

   a. Grade school ____
   b. High school ____
   c. Vocational or trade school ____
   d. College graduate ____
   e. Post graduate ____

4. Years of residence in Manhattan ____

5. Years at present address ____

6. Do you consider yourself a permanent resident of Manhattan?

   yes ____ no ____

7. How do you view the flood hazard potential in Manhattan?

   a. not serious ____
   b. somewhat of a threat ____
   c. serious ____
   d. don't know ____

8. How do you view the flood hazard potential in your immediate neighborhood?

   a. not serious ____
   b. somewhat of a threat ____
   c. serious ____
   d. don't know ____

9. Were you affected by the flood of 1951?

   yes ____ no ____ If yes, how? _____

   _____

10. How many damaging floods would you estimate have occurred in the Manhattan area in the past ten years?

    none ____ 1-3 ____ 4-6 ____ 7-10 ____ over ____

11. Have you ever experienced a flood while living in Manhattan?

    yes ____ no ____

12. Have you ever suffered any damage from floods?

    yes ____ no ____

13. Do you know if you have flood insurance?

    yes ____ no ____

14. Which of the following areas do you feel has a high flood hazard potential?

    a. Wildcat Creek ____
    b. Stagg Hill Rd. ____
    c. Ponytz Ave. ____
    d. Hunters Island ____
    e. Northview ____
    f. Third Street ____
    g. K.S.U. Campus ____
    h. West Loop ____

15. In the event of a major area flood, damage to your property would probably be:

    none _____ minor ____ great ____

16. Did you consider the flood hazard when you selected your home or place of residence?

    yes ____ no ____

17. What have you done to protect your property against flood damage?

    _____

    _____

    _____

18. What else could be done to protect your property against flood damage? _____

_____

_____

19. Have you previously moved becaused of a flood?

yes ____ no ____

20. Age ____ Sex ____

PERCEPTION OF THE FLOOD HAZARD IN MANHATTAN, KANSAS

by

GERALD PRICE SHANKLIN

B. S., North Carolina Central University, 1975

AN ABSTRACT OF A MASTER'S THESIS

submitted in partial fulfillment of the

requirements for the degree

MASTER OF ARTS
Geography

Department of Geography

KANSAS STATE UNIVERSITY
Manhattan, Kansas

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In view of the number and magnitude of floods which have occurred in this decade, it is apparent that more research efforts are needed to develop innovative and efficient ways of coping with flood problems. By studying the relationships which exist between humans and the natural environment, geographers have learned much about the attitudes of individuals in areas subjected to natural hazards. These inquiries have been useful because they often indicate whether humans respond to the world in terms of their perceptions or as it actually is. History suggests that failure on the part of people to accurately perceive their natural surroundings has a strong correlation with the damage resulting from natural hazards.

Employing Natural Hazards methodology, this study sought to assess the awareness of certain Manhattan, Kansas area residents in delimiting the overall perception of flood hazard. It considered a number of variations in attitudes concerning floods which could be related to the physical and socio-economic conditions of the study area. These factors usually play some play some role in influencing perception, as do one's past experiences.

The study area consisted of three locations in Manhattan and vicinity which were selected on the basis on flood potential. In decreasing order of their exposure to floods, these were: Hunter's Island, Wildcat Creek and Northview. Statistical analysis was performed to measure the relationship between demographic and hazard-related variables and individual response pertaining to the Manhattan flood hazard.

The results of this analysis revealed that previous hazard experience was the most significant factor in explaining a person's perception of flood hazard. Prior flood hazard experience appeared to enhance individual perception levels. Location within the study area was also found to be significant in determining the responses of the survey population. Individuals located in the site with the greatest degree exposure to floods also seemed to have the highest level (most accurate) perception of the actual flood hazard.

In assessing individual and group perception of flood hazard in the study, Hunter's Island respondents were found to be slightly more aware of the actual flood hazard of the overall study area than the other respondents. This means that

they were more accurate in answerings questions pertaining directly to the flood hazard. Assessment of individual and group perception further inducated that the people of Manhattan and vicinity placed little emphasis on floods in their selection of a place of residence. Furthermore, Hunter's Island was perceived to be the most flood hazardous location in the study area by the entire survey population, which also saw the flood hazard as only a minor threat to the community.

Although floods do not seriously threaten the Manhattan area, the potential remains for the occurrance of floods which could be of a destructive nature. Therefore, community leaders, planners and other decision makers have the responsibility to prepare for this type of emergency. In achieving this level of prepareness, it would be beneficial to have the knowledge of area residents attitudes towards this natural hazard. It is hoped that this thesis will be helpful to those seeking knowledge.