This is to certify that the

thesis entitled

A Study of the Capability of the
State of Michigan to Mitigate Flood Hazard
Based Upon the
National Academy of Public Administration
presented by

Tamara Jons Buswinka

has been accepted towards fulfillment
of the requirements for

Master's degree in Urban & Regional Planning

Major professor

Date May 1, 1996

A STUDY OF THE CAPABILITY OF THE STATE OF MICHIGAN TO MITIGATE FLOOD HAZARD, BASED UPON THE NATIONAL ACADEMY OF PUBLIC ADMINISTRATION CRITERIA

By

Tamara Jons Buswinka

A THESIS

Submitted to
Michigan State University
in partial fulfillment of the requirements
for the degree of

MASTER OF URBAN AND REGIONAL PLANNING

Urban and Regional Planning Program
Geography Department

1996

ABSTRACT

A STUDY OF THE CAPABILITY OF THE STATE OF MICHIGAN TO MITIGATE FLOOD HAZARD, BASED UPON THE NATIONAL ACADEMY OF PUBLIC ADMINISTRATION CRITERIA

By

Tamara Buswinka

Within Michigan flooding disasters cause significant financial and personal losses every year. The government of the state of Michigan has taken action to reduce vulnerability and lessen risk thereby reducing losses. This thesis investigates the capabilities the Michigan state government has developed in order to mitigate the impact of flooding disasters. To assess this capability, employees of Michigan state government were interviewed. Respondant information gathered about flood mitigation activities in Michigan was compared to criteria developed by the National Academy of Public Administration in order to determine the quality of capabilities currently present within Michigan state government. The results of this investigation indicate that Michigan does not meet all of the criteria established by the National Academy of Public Administration. The state of Michigan is fostering peer exchanges and mutual aid agreements. The state is also encouraging regional planning and preparedness efforts to further flood hazard mitigation.

ACKNOWLEDGMENTS

A great debt of gratitude is owed to my family. I would especially like to thank my husband for his patience and the countless hours of his time.

TABLE OF CONTENTS

Chapter 1
INTRODUCTION

Flooding is a serious natural hazard causing economic and personnal devastation to individuals and communities throughout Michigan and the United States. The most serious cause of loss of life and damage to property in the United States is flooding. (Palm 1990) In Michigan flooding is similarly a significant threat. (Duckworth 1995) The large number of tributaries, wetlands and high water tables makes many Michigan residents vulnerable to both riverine and shoreline flooding. The government of the state of Michigan has taken action to reduce vulnerability and lessen risk. But, what are these actions? Are they sufficient to adequately address and reduce Michigan's vulnerability to flooding?

Eighteen hundred communities in Michigan are at risk to experience a flood disaster. Only ten to twenty percent of Michigan property owners most vulnerable to flooding participate in the National Flood Insurance Program. In other words, 80% of those at risk to flooding do not have the financial protection needed to recover from a flood disaster. Approximately 200,000 buildings in Michigan are vulnerable to flooding and fifteen percent of Michigan land is flood prone. (Duckworth, 1995) These statistics illustrate Michigan's vulnerability to flooding. Because Michigan is vulnerable to flooding, community, disaster and environmental planners are interested in developing preventive techniques to

reduce the impact of flooding on the state and prevent a flood disaster. A flooding disaster brings about a crisis situation planners respond to these situations by trying to prevent a similar crisis from occurring in the future. (Alterman 1995)

This thesis will discuss the capabilities the Michigan state government has undertaken to lessen or remove the risk of a flooding disaster. The research question is what is the capability of the state of Michigan to mitigate flood hazards? This thesis attempts to describe the state of Michigan's ability to prevent flood disasters and lower flood vulnerability. Policies, legislation and programs that have been developed to reduce the chance of flood disasters, and to limit destruction, disruption and loss when they do occur will be studied. In order to determine the scope of Michigan's capability, the results of this study will be compared to six criteria established by the National Academy of Public Administration for the United States Congress and the Federal Emergency Management Agency. I hypothesize that Michigan will meet, to the fullest extent possible, these six criteria.

According to the Federal Emergency Management Agency (FEMA), flood hazard mitigation can reduce injury and loss of life. Flood hazard mitigation can also minimize social dislocation, stress and agricultural loss while protecting critical facilities and infrastructure. The benefits of flood hazard mitigation are numerous (Drabek, Hoetmer, eds. 1991) Owing to these benefits research on flood hazard reduction spans seven decades. Since the first half of this century various mitigation methods have been put to the test. Over time the focus of these efforts has shifted from technological flood reduction methods (levees, dams) to behavior modification as a tool to reduce society's risk to flooding disaster. (Holway, Burby 1993) The change in approach from engineering to policy "is due in part to the continuing increase in flood damages in spite of the

concentrated efforts of engineers through many years." (Wall 1969, p. 4) James L. Witt, Director of the Federal Emergency Management Agency (FEMA) testified before Congress that

> the time has come to face the fact that this Nation can no longer afford the high costs of natural disasters. We can no longer afford the economic costs to the American taxpayer, nor can we afford the social costs to our communities and individuals. (1993)

During the course of history the United States government has enacted flood prevention legislation to deal with the rising cost of flooding disasters. Studies show that flood prevention legislation is inadequate to reduce the potential for damage to existing development in flood hazard areas. It also has limited impact on protecting environmentally valuable resources. (Burby and French et al. 1985) In fact, the success of these regulations is uncertain. (Monday 1983) In order to address this inadequacy an alternative approach exists.

Current thinking includes the concept of hazards versus disaster with regards to destructive events like floods. To put it simply, hazards are those things that put us in harms way. Disasters are the avoidable, negative impacts resulting from decisions made in the face of unforeseen or impending destructive events. The current position holds that in most cases flood hazards are natural but flood disasters are not. Flood hazards are those entities that contribute to the potential risk of flooding. Examples include a flood plain, damable rivers or highly erodible banks of shorelines and rivers. Flood hazards can also take the form of home improvement policies with inadequate construction standards or poorly enforced building codes. The risk level of flood hazards is modifiable. For instance, flood plains kept free of construction, or dams adequately constructed to withstand flood level waters will reduce the chances of a disaster. Flood disasters are a condition of people's choices of usage of land which make it

possible for a hazard to become a disaster. (Varley, Chichester 1995) With the understanding that flood disasters are a result of behaviors, planning practices have focused on altering those practices that contribute to an increase in flood disaster vulnerability.

Current literature emphasizes flood mitigation. Flood mitigation means reducing and eliminating losses of life and property due to natural disasters through public policy and engineering innovation. Mitigation is a relatively new concept in natural disaster planning which is gaining even greater awareness amongst the public. This decade is the International Decade for Natural Disaster Reduction. The main goal of this decade is to further the goals of disaster prevention through mitigation and to stimulate research and its application. The Federal Emergency Management Agency is the federal agency responsible for civil defense and disaster planning, preparedness, response and recovery in the US. Earlier this decade FEMA established a new mitigation department within the organization. This adds credence to the idea that mitigation is important to reducing the rising physical and financial cost of natural disasters.

Mitigation is also an essential component of disaster management. After a disaster, repairs and reconstruction are completed in such a way as to simply restore damaged property to pre-disaster conditions. Such efforts expedite a return to normalcy. However, replication of pre-disaster conditions results in a cycle of damage, reconstruction, and repeated damage. Flood hazard mitigation ensures that the cycle is broken, that post-disaster repairs and reconstruction take place after damages are analyzed, and that sounder, less vulnerable conditions are produced. (FEMA DAP-12, 1990)

Mitigation can imply both structural and non-structural activities. Structural methods have comprised the traditional approach to flood control and are prominent in the history of flood prevention. Structural mitigation attempts

to contain a hazard and to strengthen exposed buildings and structures to withstand disaster stresses. Beginning as early as the 1930's structural mitigation was the most common flood control mechanism. (Popkin 1990) The US Army Corps of Engineers was responsible for many structural engineering feats including many dams, levees and reservoirs. These large scale, high-cost construction programs have saved billions of lives and dollars in property damage, but they have also be criticized for destroying aquatic habitat, scenic values and water quality. (Federal Interagency Floodplain Management Task Force 1992) Structural mitigation can be the nemesis to many communities. A false sense of security develops which induces development back onto the flood plain.

Controlling flooding, while attractive as a quick fix, is loosing way to policy that call for humans to adjust to the floods. (Varley, Chichester 1995) A more comprehensive approach has gained popularity owing to the continuing rise in flood loss despite structural flood prevention efforts. Non-structural mitigation is the current disaster planning approach. Non-structural mitigation uses government regulatory, tax spending and management powers to limit the extent to which people and property are in harms way. Flood impact modification through non-structural mitigation attempts to allow the co-existence between human and the unpredictable nature of the weather. Land use controls, local government acquisition of flood prone lands and development policies are a few standard non-structural flood hazard mitigation techniques.

Mitigation is comprised of many different actions that can be considered both engineering and policy oriented. All of the different programs, regulations, engineering activities and policies make up the capability of the state to mitigate flood hazards. Capability is central to this thesis. Capability is characterized by the extent of the collection of both structural and non-structural mechanisms to

mitigate flood hazards. The quality of the state's capability to mitigate flood hazards directly indicates the state's ability to reduce flooding disasters. Without strong capability the vulnerability to flooding will increase.

Evaluation Criteria

The criteria used to evaluate Michigan's capability to mitigate flood hazard were developed by the National Academy of Public Administration. The "National Academy of Public Administration (NAPA) is a non-profit, nonpartisan, collegial, organization chartered by Congress to improve governance at all levels--federal, state and local." (NAPA 1994) This is accomplished by using the individual and collective experience of its Fellows (NAPA members). Four hundred current and former Cabinet officers, members of Congress, governors, mayors, legislators, jurists, business executives, public managers, and scholars comprise NAPA membership. NAPA's major contributions focus on issues of interest to Congress.

The need to ensure that the state has developed an appropriate consortium of flood hazard reduction capabilities is very important. This is illustrated by three points. Requirements of the newly revised National Flood Insurance Program, which insures individuals who are in flood prone areas and establishes a pre-disaster mitigation grant fund for every state, is mandating a pro-active stance by the state to evaluate and develop capability in order to receive federal disaster assistance funds. There is also extensive and rapid development along Michigan's most errodible and floodable shorelines. (Holt, 1995) Urbanization is increasing along the many rivers, streams and wetlands which form our state's natural drainage mechanism. This is lessening the state's natural ability to regulate large amounts of water. In other words, our development practices are increasing the risk of flood disasters. (Hosak, 1995)

Because of these three points that illustrate the need for comprehensive flood mitigation capabilities this study will:

1. Identify existing capabilities so that they can be more fully utilized by Michigan's disaster and community planners;
2. Provide a means to identify underutilized and undeveloped capabilities for Michigan disasters and community planners;
3. Provide important insight to emergency and community planners wishing to undertake more extensive flood hazard mitigation;
4. Provide disaster planners a template to utilize in their own efforts to assess capability.

In order to systematically explore the capability of the state of Michigan to mitigate flood hazards this study will answer two questions: What is the capability of the state of Michigan to mitigate flooding and how does the capability compare to the performance criteria developed by the National Academy of Public Administration? The hypothesis of this study is that the capability of the state of Michigan to mitigate flood hazard will meet the performance criteria established by the National Academy of Public Administration. Having worked with Michigan disaster planners and floodplain managers I was impressed with the amount of effort exerted towards flood prevention goals. I therefore felt the state of Michigan was doing an adequate job in mitigating flood disasters and would meet the NAPA criteria. If all six criteria are satisfied my hypothesis will be accepted.

CHAPTER 2
LITERATURE REVIEW

In order to understand the state of Michigan's capability to mitigate flood hazard it is helpful to recognize the evolving research surrounding flood hazard reduction in the United States. Fundamental to this discussion is the acknowledgment of the impact of flood plain planning and disaster management on the present trends in preventing flood disasters. The general trend in flood hazard research since the 1930's has been to move from structural methods of flood control to non-structural mitigation practices. Current research has examined the social, political and economic aspects of flood disasters and emphasizes pre-disaster flood mitigation as the central planning paradigm.

The 1930's-1960's

Traditionally, disaster planning literature used case study reports to identify structural mitigation activities which were successful in preventing flood disasters. Levees, dikes and reservoirs were the principal methods employed to control floodwaters. Among the first national institutions attempting to decrease society's vulnerability to flood hazards through structural mitigation were the Tennessee Valley Authority and US Army Corps of Engineers. These groups undertook structural mitigation activities starting in the 1930's and 1940's to spur development of land by decreasing the threat of flooding along major rivers. (Drabek 1991) During this period it was understood that flood control "did not

mean the elimination of floods. At best, it...provided only a certain amount of protection against over-bank flows." (Leopold, Muddock 1954 p. IX)

Structural methods proved to be successful in many cases. However, with increasing urbanization, and a larger number of people residing in flood prone areas, these methods did not eliminate flood disasters. New approaches to flood prevention gained momentum within fields such as disaster and community planning. Land management, in conjunction with flood control engineering practices, came to be recognized as a key factor in flood disaster prevention. The use of planning (such as zoning) combined with engineering was first being suggested and researched as a viable addendum to flood control measures. (Behrens 1952; Murphy 1957) "The field...grew out of attempts by geographers to explain the continuing failure of U.S. flood control policies to curb losses despite heavy investments in physical science research and engineering protection programs. During the 1940s and 50s most conventional analyses of flooding considered it a physical phenomenon that could best be dealt with by physical means. Flood probabilities and structural engineering responses were regarded as the principal factors that affect hazards..."(Mitchell 1990 p.34) The value of identifying and researching structural mitigation practices lies in its ability to enable a community to adapt specific structural techniques to control flood waters within their community. These practices, however, are only small steps to removing the threat of a flood hazard.

The 1970's

During the 1950's and 1960's non-structural mitigation gained more emphasis but by the 1970's the structural approach to flood prevention still dominated research. (White 1975) Although, efforts were being made to identify hazards within communities the catalyst for hazard identification efforts came from the federal government.

Hazard Identification

For forty years the government has attempted to institute preliminary measures to mitigate the effects of a flooding disaster. Over that time there had been no single coordinating body responsible for the response, recovery, preparedness, and mitigation of flood hazards. In 1979 the Federal Emergency Management Agency (FEMA) was created. FEMA took on the responsibility of planning and coordinating peace and war-time disaster programs. FEMA, as well as the Army Corps of Engineers, is currently responsible for flood disaster preparedness, response, recovery and mitigation planning efforts. (Moore and Moore 1989)

The creation of FEMA added new responsibilities to the duties of state, county and local disaster and community planners. The responsibilities included identifying potentially high risk areas within the state. This was done in order to identify structural and non-structural mitigation projects. Specifically, this preliminary research studied rivers to assess their flood hazard potential.(White 1977; Sewell 1977; Odingo 1977) Rising populations and the increasing rate of development along rivers and shorelines were also studied. In Michigan for example, by the late 70's detailed studies of all the major rivers and floodable shorelines had been done by the Army Corps of Engineers, U.S. Soil Conservation Service, Michigan Department of Natural Resources and academic researchers. The purpose of these studies was to assess Michigan's vulnerability and risk to flood disasters. (U.S. Soil Conservation Service 1971, 1976; Michigan Department of Natural Resources 1981; U.S. Army Corps of Engineers 1969, 1970, 1972,1974,1975, 1976; Henderson 1949; Clarence 1932) These studies identified high risk areas in western Michigan. These areas are vulnerable to flooding and high rates of erosion, the latter occurring at approximately one foot a year. Major rivers and watersheds, such as the Rouge River, the Huron River Watershed and

the Saginaw River Watershed, are susceptible to flooding on a seasonal basis. In addition, studies revealed that many Michigan homes are at risk of seasonal flooding of basements because of the high water tables that are characteristic of Southeastern Michigan.

Flood hazard studies concluded that non-structural practices are the most important tools for flood prevention in Michigan. (Applied Environmental Research 1976) The importance of non-structural mitigation practices in flood prevention is easy to understand in light of the many sources of flood risk in Michigan. A high water table, an intricate system of watersheds and wetlands, high erosion shorelines, and major rivers all contribute to flood risk in Michigan. The natural drainage system in Michigan is extensive. Because the drainage network is interconnected, alteration of the system can lead to a break down of its natural drainage function. In many respects structural mitigation is unable to address these types of problems. Because of its awareness of Michigan's vulnerability, the state government began to apply non-structural mitigation on a regional scale to development of shorelands. The goal of the state was to provide opportunities to guide development while also satisfying community goals. (Applied Environmental Research 1976; Managing Coastal Erosion 1990) It was only recently, with the enactment of the Michigan Natural Resources and Environmental Act in 1990, that these types of restrictions and planning efforts were required for inland water ways as well as shoreline areas.

Hazard identification research played an important role in educating Michigan citizens and law makers about non-structural mitigation. As a result of the collected research of these investigators and agencies the 1970's saw a shift in the approach to flood mitigation. For the first time non-structural mitigation, rather than structural mitigation, was suggested to take the primary role in flood hazard reduction. The application of this concept was used to alter existing

practices used for proposed development in flood hazard areas. Alternative development practices include prohibiting development from the shoreland, recommending alternative locations for development, requiring modification of the proposed development so as to withstand flood risks or requiring abandonment of a project due to its high flood vulnerability. (Applied Environmental Research 1976) The development of alternative, non-structural development practices suggests that non-structural flood reduction efforts were becoming incorporated into local planning efforts and that mitigation was becoming a key concept.

The 1980's

Prior to the 1970's structural flood mitigation techniques were the dominant techniques being developed and implemented. During the 1970's studies were conducted to assess a river's potential for flooding. Stemming from this led to development of non-structural methods of flood prevention. During the 1980's the design and application of non-structural techniques were refined through research. Literature emanating from the 1980's identified constraints hampering development of non-structural flood mitigation capability. Relatively little effort was put into studying the social, economic or political factors that also influenced flood mitigation. Lack of knowledge about the implication of these factors prevented the successful adoption of non-structural mitigation practices. (White 1975) In addition researchers sought to understand how to assess risk and vulnerability more accurately. This research called into question floodplain management programs and the National Flood Insurance Program.

Constraints on Capability Development

The attitude of policy makers is an important issue when attempting to understand the process of incorporating local and state government flood hazard mitigation into administrative practices. The degree and type of political support

for mitigation can be used to predict the development of capabilities. Peter Rossi, James Wright and Eleanor Wever-Bur (1981) undertook a systematic look at the political support for non-structural and structural mitigation practices. The study focused on state and local government political elites that occupied positions of influence in state and local government. These include governors, mayors and city managers, local legislators, state legislators, planners, state geologists, civil defense directors, and representatives of real estate, development and insurance.

The results of Rossi, Wright and Wever-Bur's study reveal that these elites support structural mitigation and post-disaster relief rather then non-structural and pre-disaster mitigation. In addition, most political elites favor the NFIP even though the policy of the program is non-structural hazard mitigation and compulsory insurance. Most political elites also do not favor land use controls, which are among the most essential tools to implementing mitigation. These findings highlight the preferences of both policy makers and the implementors of flood mitigation. The ramifications of these views are reflected in the quality of the state capability to mitigate flooding.

A study conducted by William J. Petak and Arthur A. Atkisson (1982) suggested that the development of natural hazard capabilities is a function of a diversity of governmental institutional beliefs.

> Whatever direction may be taken in respect to natural hazards management policy making, the objective outputs of the policy-making process will also be influenced by constraints having to do with the characteristics, configurations, internal quality, authority, and funding capacities of individual jurisdictions of government and of their organizational components. (Petak, Atkisson 1982 p. 102)

In other words, the extent of risk and vulnerability is not the sole driving force in the development of flood hazard mitigation capability. Capability development is hampered by institutional personalities. Ultimately, this limits the advancement of flood disaster prevention.

Another key finding of the Petak and Atkisson study speaks to the limited methods and tools available for assessing capability. "...There have been no major recent studies focused on the development of quantitative descriptors of the excellence and capacities of these institutions and organizations in the several levels of U.S. government."(Petak, Atkisson 1982 p. 34) However, understanding the constraints on the development of capability provides important insight to a state and local government's ability to reduce flood hazard vulnerability.

The two primary administrative constraints on non-structural capability development are building code enforcers and planners. Petak and Atkisson suggest that because building code inspectors may have limited prestige, low pay, inadequate education or non-professional status they do not perform their job adequately. This, in turn, contributes to an increase in the vulnerability of home owners and communities. Though approved as up to code, buildings may not meet even minimum safety standards. In addition, building code inspectors may resist changes in inspection criteria. Such resistance may mean that beneficially stricter building codes for residences near high flood risk areas are never implemented or enforced.

Petak and Atkisson also find that universities are not preparing urban planning graduates to deal with natural hazard reduction stating "... few academic curricula introduce urban and regional planning students to, or train them in, avoiding or mitigating natural hazards." (Petak, Atkisson 1982 p.46) Thus planners are not taking into consideration the vulnerability of a community when developing master and land use plans. Failing to fully consider natural

hazard leads to land use schemes that may increase the vulnerability of a community.

Assessment of Vulnerability and Risk

In addition to studies done on the constraints to capability development studies undertaken also included more sophisticated assessments of vulnerability and risk. Vulnerability and risk assessment are important components of disaster management. Simulations and modeling are used to assess vulnerability and risk. (Research Alternatives 1984) These simulations input data about a geographic area such as land use, population, infrastructure, carrying capacity. Using inputted data these tools simulate different flood hazards to predict disasters along rivers. For example, physical modeling of water waves for coastal regions has also been done in order to understand wave action and their effects on coastal communities. (Svendsen 1985; Wang 1985) Case studies are also used to assess different policy options communities select to mitigate flood hazards.

Disaster case studies have traditionally been used to understand the strengths and weaknesses of utilizing structural methods for flood control. (Barton 1969) Failed or inadequate structural flood control methods can be studied to understand how to modify flood vulnerability. During the 1980's extensive use was made of case studies as a tool to understand realistic conditions of a disaster. It is hoped that in so doing a greater level of predictive power and information can be gained about current and future events. (Charles 1985) Case studies are used to evaluate regulations and policies, as well as to evaluate flood prevention regulations and flood plain planning practices. (Burby, French, Cigler, Kaiser, Moreau, Stifter 1985) The most significant finding of case study research has been to recognize the lack of real understanding about the effectiveness of flood plain management practices. Evaluation tools were not

available to verify that a specific action was successful in protecting a community both financially and socially from a flooding event. In addition, there is a need to better evaluate flood management programs so that it can be determined whether the cost of program development within a community is justified by the level of risk of a flooding disaster.

Studies have also looked to understand how communities have adjusted to environmental hazards. (Burton, Kates, White 1978) The results indicate that those communities most willing to alter their development practices and institute tough non-structural policies are the communities most repetitively affected by flooding events. The way in which individuals and communities recover from success and failures of the National Flood Insurance Program has been studied in order to understand the assumptions of disaster assistance programs and factors that reduce their effectiveness. (Cuny 1983) Authors have also studied perceptions of risk in order to understand why commercial and residential development have occurred in hazardous areas and why current policy does little to limit society's vulnerability. (Douglas, Wildavsky 1983; Brabek 1985 and 1986; Dynes 1970) The most significant finding of this research is that individuals who are located or developing in flood hazard areas are lured by a false sense of security believing a flooding disaster will not occur because of the many structural devices in place to control flooding.

The culmination of research and experiences since the 1930's has been a fundamental shift in methods of flood prevention. This can best be illustrated by the Corps of Engineers shift to non-structural flood hazard mitigation planning for both coastal and river flood hazard areas. (Moore, Moore 1989) The value of research analyzing capability constraints has been its ability to shift thinking. Researchers have begun to understand why previous flood hazard reduction techniques were not implemented. In the same way researchers have also

identified where political constraints exist which prevent new techniques from being implemented. Information gathered by simulation, case study evaluation, sociological study of disaster and recovery can help shed light on institutional contributions to mitigating flood hazards.

The 1990's

As a result of many decades of flood disaster prevention research non-structural mitigation practices have taken root in many local and state governments in the United States. However, the use of both non-structural and structural mitigation is seen as a comprehensive effort to achieve flood prevention goals. In addition, multi-objective management, or managing with the intent of satisfying two or more goals, is seen as an economical way to use public funds in governing communities. During this decade multi-objective management is helping to provide economic justification for protecting our natural resources from development. Multi-objective management stimulates the development of mitigation capabilities because natural resources are in an increasingly obvious way linked to mitigation of flood disasters.

Flood Pain and Natural Resources Management

The use of natural resources as buffers to limit flood disasters has long been known as wise management practice. Natural resource utilization has taken on renewed importance since President Bush's 'no-net-loss' policy went into effect. This policy allows for the destruction of natural wetlands if those wetlands can be moved to another location. In an effort to fight the 'no-net loss' policy, environmentalists have tried to identify the importance of aquatic ecosystems and their ability to produce tangible benefits. For example, disaster managers understand that protecting wetlands in their natural locations prevents flooding, raises water quality, increases water supply and provides a haven for many species of endangered wildlife. (Larson 1991) Lakes and reservoirs are also

important flood control devices. (Cooke, Welch, Peterson, Newroth 1993) The use of natural resources as disaster modifiers is increasingly important as urbanization continues. Unfortunately, these benefits are often un-measurable or taken for granted. As our natural resources are compromised by urbanization and infrastructure is strained, communities in flood prone areas will experience increased vulnerability. For example,

> as urbanization continues around the world, the number of 'megacities' continues to increase; current predictions suggest that by 2000 there will be 28 cities with populations in excess of the nominal 8 million threshold...much of this growth is rapid and unplanned and this contributes directly to an increase in the vulnerability of the city to natural disaster. (Steedman 1995, p. 89)

Development and rapid population pressures are not only being felt by large cities but also by smaller communities; especially those communities with inexpensive flood plain land ripe for development. The correlation between natural resources and flood mitigation is not being realized to the fullest extent possible by professionals associated with either the environmental or the emergency management fields.

Criticisms of Natural Hazard Research

Disaster planning has not been totally successful in utilizing multi-objective management. They also have done a poor job at integrating research from other disciplines. This is because disaster research is fragmented and limited in many important areas of interest. It has been suggested the reason for the fragmentation and limited scope of disaster research is in the multi-disciplinary nature of the study as well as in the stumbling blocks to the difficult nature of measuring accomplishments and programs. A fundamental goal of the decade is to improve disaster research and its application. In addition, as Professor A.K.M. Kafiluddin states, in his assessment of disaster preparedness

for Bangladesh floods and other natural hazards, one of the goals of the IDNDR is "To improve the capacity (capability) of each country to mitigate the effects of natural disasters expeditiously and effectively..." (Kafiluddin 1992 p. 68) How to improve the capability is an emerging topic in disaster research. James K. Mitchell discusses the human dimensions of environmental hazards, comments on disaster research and evaluates integration of this research into policy. He states that the fundamental problems facing natural hazard researchers today are the limits to the theoretical and conceptual bases of the field, as well as the transition of natural hazard research from focusing on structural practices to non-structural practices.

He also argues that there is a need to more effectively use hazard research to improve hazard management practices.

> The dominant characteristics of research on persons and hazards are complexity and disparity, accompanied by a search for guidance. Complexity stems from the nature of the hazards addressed. Disparity occurs in the variety of interpretations offered. The search for guidance is driven by an awareness of the need to devise rules for choosing among diverse contributions and the need for better organization of the intellectual domain if there is to be more effective use of hazards research knowledge to combat mounting hazard management problems. (Mitchell 1990 p. 16)

This speaks to the need for a more efficient exchange between researchers and practitioners. (Mitchell 1990)

Evaluation of the National Flood Insurance Program

Despite the need for continuing research on the subject of flood disaster management, disaster and community planners utilize federal legislation to reduce communities vulnerability to flooding. Of particular importance to the issue of mitigation capability is the National Flood Insurance Program (NFIP). This program mandates flood hazard mitigation planning as a prerequisite to

receiving disaster assistance and flood insurance after a disaster has occurred. If communities do not participate in the NFIP, federal financial aid is not guaranteed to disaster stricken communities. The NFIP was developed to insure residents who occupy the flood plain for the cost of recovery after a flooding disaster occurs. The program is officially recorded as *Title V National Flood Insurance Reform Act of the Community Development Banking and Financial Institutions Act of 1993*. In 1994 the NFIP was updated to reflect the changing views on government's inability to pay for recovery of flooding disasters. Updates to the NFIP in 1994 also imposed mitigation requirements on any home owner in the program. These included structural standards imposed on existing homes as well as non-structural and structural standards required for new development.

Changes in the NFIP included the formation of the Mitigation Assistance Program which emphasizes mitigation more forcibly by providing an increase in financial assistance to those communities wishing to create and implement mitigation plans. The Mitigation Assistance Program will provide funding for the establishment of state sponsored Pre-Disaster Mitigation Funds and Disaster Trust Fund. (Natural Hazards Observer 1996) By the year 1996, twenty million dollars will be available by application for states and communities. States and communities can only apply once every five years. One in one half million per state and one hundred and fifty thousand dollars per community is available. (Title V of the Riegle Community Development and Regulatory Improvement Act of 1994 Section 553) These funds will be used for pre-disaster mitigation activities such as relocation and structural retrofitting.

Once flood hazard mitigation plans are prepared, mitigation activities or projects can be implemented. These activities must be approved in the Flood Mitigation Plan, be technically feasible and cost effective to the National Flood

Mitigation Fund. Funding can also be used as a state developed flood hazard mitigation fund. It is important to note that both the NFIP and the Mitigation Assistance Program seeks to eliminate repetitive losses and substantial damages in part by instituting post-disaster rather than pre-disaster measures. These include elevation, flood proofing and minor structural mitigation efforts. The primary emphasis, however, is on non-structural mitigation measures such as relocation or demolition of structures in high flood risk areas. Recent changes in the NFIP language also provide additional monetary resources for compliance with land use policy and other control measures imposed by communities or states. Examples of these control measures include flood plain zoning ordinances or relocation and acquisition statutes. This means that communities have more support for implementing tough land use control decisions when they are specifically designed to protect public welfare. In order to aid communities in determining flood risk zones the NFIP requires communities to develop and update flood maps every five years.

For decades insurance through the NFIP has also been used as a way to alleviate the consequences of a flood disaster. Researchers, however, are concerned that the success of this program actually has significant negative implications. One of the desired outcomes of the NFIP is to deter new development from flood plains and other flood prone land. But in ensuring that post disaster funds are available, the NFIP actually provides incentive to stay in the flood prone area. Some economists predicted that the cost of required structural improvements to homes already located within the flood plain would cause owners to move away from the flood plain. It has been found, however, that the structural requirements of the NFIP, while reducing flood losses, have little effect on the rate of development in the flood plain. (Holway, Burby 1993) What is needed is a more comprehensive flood hazard mitigation program that

considers structural mitigation practices such as elevation requirements included within the terms of home mortgages, stronger building inspection criteria and financial incentives to locate in other areas besides flood plains.

In addition to the significant attributes of the NFIP, other federal programs are contributing to flood mitigation. One of the premiere efforts in promoting pre-disaster mitigation is the Unified National Program for Flood Plain Management. Flood plain management is structured around a decision making process which aims to achieve the wise use of the nation's flood plains. The purpose of managing flood plains is to reduce the loss of life, the disruption, and the damage caused by floods. At the same time it is hoped that management will be successful at preserving and restoring the natural resources of the nation's flood plains. This strategy assumes that an abundance of positive benefits come from flood plains. The benefits of flood plains include the ability to act as natural buffers between the river and town when a flood occurs. (The Natural Hazards Research and Applications Information Center 1992)

The Unified National Program for Flood Plain Management recognizes that flood loss reduction requires both planning and management at the community, regional, and national level. Land use regulations are key to the Unified National Program for Flood Plain Management. Likewise, quality infrastructure (providing local drainage and storm water management) land acquisition, building requirements and emergency response systems are significant parts of a successful flood plain management program. The Unified National Program for Flood Plain Management in concert with the NFIP are meant to provide both the guidance and the funding for comprehensive flood mitigation planning. However, despite the existence of this federal framework for local government, use flood hazard mitigation remains underutilized. It has been found that "while local governments and their leaders are most likely to

have to respond to flood disasters...flood hazard management is not a major priority of government." (Cigler, Burby 1990, p.xv) It is the conclusion that the NFIP is the greatest impetus for local government action in flood prone areas. (Cigler, Burby 1990)

It has also been found that when state governments try to motivate local municipalities to implement flood mitigation programs, a mix of cooperative and coercive approaches are required. (May 1994) Direct state regulation of flood hazard areas tends to reinforce the effects of local programs, making communities more likely to achieve their objectives. (Burby and Fench, 1981) Further, because most state agencies have relatively little interest in mitigation, there occurs a fragmentation and denial regarding how mitigation can be incorporated within each agency's agenda. (Vogt 1994) One reason for this ignorance stems from the complexity of mitigation initiatives and the subtle links between the political, social and engineering aspects to mitigation.

During the 1990's, researchers still study structural mitigation methods. A much more concentrated effort exists to identify and evaluate non-structural mitigation measures. With the importance of the IDNDR and the Unified National Program for Floodplain Management, as well as the contribution of both the engineering and social science disciplines, flood hazard mitigation is seen as a preventative method to reduce the social and financial cost of flood disasters. Much more time, however, is being spent understanding how flood hazard mitigation can be integrated into existing federal and state capabilities so that the goal of comprehensively planning for our communities can be achieved. Therefore, the nature of this thesis is to contribute to the literature by identifying and assessing capabilities available within the state government of Michigan. It is a goal of this thesis that the results can be utilized by federal and state government wishing to undertake flood hazard mitigation planning.

Chapter 3

STUDY AREA AND METHODS

Study Area

Michigan is an environment with an abundance of water. Because of this abundance, flooding is a serious natural hazard. Six percent of Michigan land area, including 200,000 buildings, are considered prone to flooding. (Hosek 1995) Seventy-eight percent of Michigan's shoreline is susceptible, eight percent is deemed at high risk of erosion, and nine percent is considered flood prone. The highest risk areas of the state are in the populated southern two-thirds of the Lower Peninsula, including the glacial lake bed areas along Lake Erie, Lake St. Clair and Saginaw Bay. Nationwide, annual flood losses average nearly four billion and continue to rise. Flood losses in Michigan reflect this upward trend, with annual flood related damages estimated to be between sixty and one hundred million. (EMD PUB-103, 1992)

In Michigan, the majority of floods occur in early spring and are the result of excessive rain fall or the combination of rainfall and snow melt. Floods also occur as a result of thunderstorms that heavily impact water courses with smaller drainage areas. Since 1982 there have been three Presidential disaster declarations and six Governor's disaster declarations for flooding in Michigan. The resulting price tag is estimated to be over fife hundred million dollars in damage. (EMD PUB-103, 1992) Six individuals lost their lives during the flood

disasters and ninety individuals were injured. A total of 3,600 miles of roadways were impassable during these disasters as a result of the failure of four primary bridges and hundreds of secondary roads, bridges and culverts. The number of homes damaged equated 32,500.

Flooding is exacerbated when a dam fails. MDNR estimates that over 263 dams have failed in Michigan since the onset of record keeping in the early 1900's. (Dexter 1995) In addition, shoreline erosion contributes significantly to Michigan's flooding problems. The MDNR estimates that since the 1950's the high water levels which cause shoreline flooding have resulted in millions of dollars worth of damage. (Duckworth 1995) In the mid-1980's alone the Governor of Michigan declared seventeen disaster areas in shoreline counties. Damage estimates reached over one hundred million dollars in losses to property. (EMD PUB-103, 1992) As these statistics suggest, flooding is a major financial and social concern in the state of Michigan.

Data Collection Methods

For the purpose of information gathering, I chose to interview state agency employees, who were referred to me by the Michigan Department of State Police-Emergency Management Division, the primary disaster planners for the state. Virtually all state agencies are positioned to further the goals of flood mitigation. For example, mitigation opportunities can be found in state building practices, the distribution of block grants, the positioning of parks and other state recreation land. In all of these examples, flood mitigation can be incorporated.

In 1987 the Michigan disaster planners sent a lengthy and complex questionnaire to state agencies requesting information about any capabilities that had been developed that would meet the goals of flood mitigation. This questionnaire was unsuccessful. The length of the questionnaire, perceived importance of the topic or the subtle nature of the concept could have

contributed to the lack of response. No formal study of a state's flood hazard reduction capabilities has been developed.

Therefore, I designed a study that required interviews that were to last one-half to one hour long. I sent information about mitigation before the interview to educate and give ample time for each interviewee to collect their thoughts and any additional information that may have been needed for the interview session. I interviewed employees from the Department of Labor, Natural Resources, Commerce, Corrections, Public Health, Management and Budget, Military Affairs, and the Michigan Jobs Commission. (See Appendix A for a complete reference.) Sixteen state department employees were interviewed. However, interviews often included other department employees who became involved in the discussion as their expertise was needed to answer the interview questions.

I came prepared with questions to help direct and begin the conversation. (See Appendix B) However, actions are often developed for purposes other than mitigation even though they contribute to the same ends. I wanted to be able to explore tangents in the conversation in hopes of this type of discovery. In retrospect, this is when I gathered the greatest amount of information. I was not looking for opinions. Rather, I wanted to find even the most subtle of mitigative capabilities. Through the interview process I expected to obtain information regarding a wide variety of strategies for flood mitigation. Mitigation in its most comprehensive form is a multifaceted activity. I expected the contributions of each agency to be reflective in some way of its overall mission. For instance, I expected to hear about the flood proofing of buildings, but not necessarily from the same agencies that were concerned with education and communication linkages between state and local governments. Similarly, I anticipated information about the interactions of planners and decision makers, but not from

the agency who's primary concern was the creation of recreational opportunities through public and private ventures. Among the other expected topics were public acquisition of land for open space purposes, mitigation minded financial incentives to homeowners and builders, and the inclusion of disaster research in public policy.

Interviewing was performed with only a few questions that were intended to stimulate thought and discussion. This led to a greater awareness of state agency policies concerning flood hazard mitigation. In addition, I obtained better responses to the study as compared to the previous study conducted by the Emergency Management Division. Each interview lasted approximately 45 minutes. With the consent of the interviewee, the interview discussions were taped. However, it became apparent that the interviewees were uncomfortable with this method and did not feel as free to discuss the lack of capabilities within their department while being taped. I suspect it was not politically acceptable to admit a lack of effort toward protecting people from the effects of a flooding disaster. Note taking became the method used to record information, with the consent of the interviewee. This even appeared to hamper a candid discussion. Ultimately, note taking of key words was used in order to maintain constant eye contact with the interviewee.

Interviewing with minimum note taking seemed to put the interviewees more at ease. The interviews took the form of candid discussions and information was afforded without political consideration. Responses where then written in descriptive form after the interview. Within five days, summaries of the interview were given to the interviewee for review and approval. In some cases additional interviewing was necessary to clear up misconceptions or gather additional information. All interviewees were assured confidentiality.

Capability Assessment Criteria

This thesis studies the capability of the state of Michigan to mitigate flood hazards by its initiatives to use federal and state resources to mitigate flood hazards. In order to have a frame of reference or yard stick by which I could synthesize and gauge capability I used capability assessment criteria developed by the National Academy of Public Administration (NAPA). These criteria was not developed to be all inclusive in evaluating capability. Such criteria have not been developed by academics or by FEMA. This criteria is designed to act as a starting point to assess capability. The criteria examine the following issues:

- Has the state created a strategic plan for upgrading state and local government capability for emergency management and planning?
- Is the state using financial incentives strategically to reward effort and encourage competent performances within state and local government?
- Is the state working to improve training and education with state and local government?
- Is the state encouraging research and its application?
- Is the state fostering peer exchanges and mutual aid agreements?
- Is the state encouraging regional planning and preparedness efforts?

The first criteria evaluates whether the state has created a strategic plan for upgrading state and local government capability for emergency management. This refers to the development of a multi hazard mitigation plan that addresses all types of hazards. Such a plan would aid states in the fair distribution of technical, financial and educational services. A flood hazard mitigation plan would comprise a detailed assessment of risk and vulnerability with clearly identified flood risk communities and administrative flood mitigation opportunities within the state.

The second criteria evaluates whether the state is using financial incentives strategically to reward effort and encourage competent performance within the state and local government. In order to satisfy this criterion, the state should have funding mechanisms to provide for monitoring, evaluation and other requirements. The state should also have mechanisms that create or enhance incentives to maintain at least a minimum level of capability at both state and local levels of government. Financial incentives for mitigating flood hazards is critical for a successful flood hazard mitigation program. As review of the literature reveals, the greatest impetus for flood management by local communities is the requirements of the NFIP. The financial risk of not participating is great. A lack of funding can pose the most limiting factor to recovery efforts after a disaster has occurred. If a community can be positively rewarded for mitigative efforts undertaken before the disaster occurs there is a greater chance that mitigation will be considered in the future. Positive incentive versus negative reinforcement is seen as a more inspiring method to facilitate flood hazard mitigation.

Improving training and education within state and local government is the third criterion evaluated. In order to fulfill this criterion, the state had to have developed educational opportunities within the emergency management profession and other related professions. These include academic and planning community opportunities to learn about flood mitigation. Education is key to spreading greater awareness and fostering public participation within communities. Since the 1930's, when the Army Corps of Engineers began implementing structural mitigation to control flood waters, techniques for preventing flood disasters have matured. The government now believes non-structural approaches are the most economical and reliable method of flood

disaster prevention. This technique requires greater public participation and awareness which is enhanced through education.

The fourth criterion evaluates whether the state is encouraging research and its application. This criterion seeks to foster research within the state government, at the local level and within universities. As the literature discusses, a fundamental goal of the IDNDR is to foster greater research initiatives within the field of disaster management and incorporate this research into emergency and community planning initiatives. The challenge of the IDNDR is directed primarily at the federal governments throughout the world. However, state governments are wise to accept it as well. Land grant colleges and other interested academic institutions are ideal for providing this type of outreach.

Fostering peer exchanges and mutual aid agreements by the state is an important criterion for assessing whether the state is improving intergovernmental relationships and the government's relationship with various professional associations and organizations. Building a network of professionals is imperative for reaching different disciplines and providing education and incentives to advance flood hazard management. In addition, it is one of the unique forums where public and private entities can bring forth innovative responses to the challenges of implementing flood mitigation strategies. It is also a way to reassure different sectors of the economy that flood hazard mitigation provides long term benefits to all the residents of Michigan.

Encouragement of regional planning and preparedness efforts is essential in order to achieve flood prevention on a state wide scale. This criterion evaluates whether the state has developed a variety of resources in order to achieve regional vulnerability reduction. Flood mitigation is concerned with reducing the vulnerability of the state as a whole. Therefore, it is important that

mitigation goals can be achieved at the regional level rather than being effective solely within discrete individual communities. Flooding occurs regardless of municipality boundaries and therefore must be approached holistically regardless of political geographical boundaries.

The capabilities of the state were compared to the NAPA criteria. If all six criterion were completely satisfied, I would accept the hypothesis that the state of Michigan satisfied the NAPA capability assessment criteria to the fullest extent possible. Partial fulfillment of the criteria would result in a rejection of the hypothesis.

Chapter 4

RESULTS

The result will be presented based on their fulfillment of the NAPA criteria. These results are descriptive summaries of the information obtained from interviewing state agency employees. These six criteria are:

- Has the state created a strategic plan for upgrading state and local government capability for emergency management?
- Is the state using financial incentives strategically to reward effort and encourage competent performances within the state and local government?
- Is the state working to improve training and education with the state and local government?
- Is the state encouraging research and application of this research?
- Is the state fostering peer exchanges and mutual aid agreements?
- Is the state encouraging regional planning and preparedness efforts?

The purpose of this investigation was to evaluate Michigan state government's capability to mitigate flood hazard by comparing the results to the performance criteria established by the National Academy of Public Administration. It was hypothesized that the capability of the state of Michigan to mitigate flood hazard would meet the criteria established by the National Academy of Public Administration. Beginning with the first criterion each of the

NAPA criteria are individually examined and compared to the existing flood mitigation efforts in Michigan.

Criterion one: Strategic Plan

The state has not created a strategic plan for upgrading state and local government capability for emergency management. The only initiative towards a comprehensive assessment of capability development and assessment came ten years ago from an executive order by Governor James Blanchard. Executive Order 1977-4 "State Flood Hazard Management Plan " requires all state agencies to evaluate flood hazards when planning for the location of new facilities and precludes the use of flood plains in connection with the facilities. In addition, agencies with existing buildings located within the flood plain must take flood hazard precautions such as education and flood proofing to lessen the effect of a flood. All state agencies responsible for programs that deal with land use planning must take flood hazards into account during the planning process.

Despite the fact that flooding is a major hazard affecting the state and that mitigation planning is considered a very important aspect in preventing flood disasters from occurring, (Duckworth, 1995) the state lacks a comprehensive flood hazard reduction plan. There does not exist one guiding principle, policy or plan that directs the development of legislation, agency policy or natural resource development in regards to sound flood hazard mitigation principles. One reason for this omission is a lack of coordination, cooperation and communication between the state government sections concerned with flood mitigation. The Flood Hazard Management Section and the Great Lakes Shoreland Section are subdivisions of the MDNR concerned with riverine and shoreline flooding respectively. The Emergency Management Division of the Michigan State Police is responsible for statewide coordination of all monetary and disaster planning efforts. While facing different aspects of flood mitigation

planning all three sections participate in the mitigation planning process and implement mitigation strategies. (Hosek, Duckworth 1995) These three sections have neither combined efforts nor developed one state wide flood hazard mitigation plan which would address capability development and upkeeping.

Criterion Two: Financial Incentives

The state has developed neither funding mechanisms for localities, nor mechanisms that create or enhance incentives to maintain at least a minimum level of capability within state or local government. The lack of financial resources available to local governments is a roadblock to initiating flood hazard mitigation. The Federal government has clearly stated that those wishing to put themselves at greater risk are going to have to assume a greater proportion of the responsibility for disaster losses incurred as a result of that decision. Monies for recovery after a disaster are shifting from the federal subsidies to state and local governments financial responsibilities. This means that the state needs to take a more active role in developing financial incentives and opportunities for local governments. As the literature review revealed, the states generally prefer to retain the NFIP rather than develop state sponsored financial incentives. That is reflected in the results of this study.

The state of Michigan substantially relies on the NFIP and the Stafford Act for funding of mitigation. Approximately 1800 communities in Michigan are eligible to participate in the National Flood Insurance Program (NFIP), but thirty eight percent of those communities actually do. There are 14,000 policy holders for structures located within a flood plain equating ten to twelve percent of property owners who are located in flood hazard areas participating in the NFIP. In order to fully take advantage of the NFIP and encourage as many communities to stay eligible for the program, the MDNR audits communities who participate in the NFIP. The purpose of the audit is to identify the

communities not adhering to requirements of the NFIP. Once the violations are identified, they are presented to a community with the mandate to develop strategies that will bring the community into compliance with the program. If the strategies are not developed and implemented, the community losses eligibility to participate in the NFIP. (Hosek, Schrauben 1995)

These are innovative and persistent steps in maintaining participation in the NFIP. Additional efforts, however, are needed. Funds and other incentives for local flood mitigation planning are not available for communities not participating in the NFIP. Nor are there efforts to link public and private entities to initiate joint flood mitigation efforts. In addition, incentives to incorporate mitigation in planning and development practices have not been supported. This can be expressed by the view of one state agency that flood mitigation is impractical for the state to financially support when there is flood insurance and a perceived assurance that the federal government will pay for recovery costs. In addition, the state legislature has failed to allow local government to have greater statutory support over land use decisions. Statewide coordination and standards for river activities is also absent. Both regional land use and watershed management efforts need continued support and refinement within Michigan in order to improve flood mitigation capability.

Land use bills presented in Michigan's 1995-96 legislative session were designed to strengthen a community's authority over land use. They would also aid communities developing innovative ways to mitigate flood hazards. Both bills were rejected by the state legislature. Senate Bill 266'1995 focused on community development and would provide the mechanisms for communities to coordinate with each other when assessing regional impact of development on the environment. This bill would enhance flood mitigation efforts by encouraging a comprehensive assessment of how development would impact a

community and increase vulnerability. Senate Bill 129'1995 would create river basin management councils able to assess river systems and tributaries in order to develop a coordinated ecosystem river management directive. River basin management councils would complement Michigan's Local River Management Act by linking watershed councils in dealing with statewide river management issues. While these bills were not developed to deal with flood mitigation directly they are resources that can be used to mitigate flooding. They add to the state's capability to mitigate flood hazards. However, they have not been strongly encouraged.

Criteria Three: Training

The criterion which examines state developed flood mitigation educational opportunities within the emergency management profession and other related professions is not satisfied. The state partially fulfilled the criteria by providing educational opportunities for emergency management professionals and interested local governments. However, opportunities do not exist for other related professions such as the academic and planning community. As the literature review showed the greatest impetus for flood plain management is the NFIP. The results of this study indicate that many flood prone communities in Michigan are not subject to mandates requiring management of flood prone lands. Therefore, it is left to the professionals within individual communities to reduce vulnerability. However, many of these community based professionals are under trained in the methods of vulnerability reduction because the state does not provide continuous training and support to them.

While the state is not providing education and training opportunities for professionals outside the emergency management arena the state is providing education and training opportunities for interested local governments. The

MDNR participates in Multi-Disciplinary Committees which are convened to familiarize local governments with flood mitigation. A wide variety of issues are covered including flooding awareness and prevention. In addition, workshops for lenders, realtors, insurance agencies, citizens and any other interested parties are provided for by the MDNR. The workshops cover a variety of subjects and presentations are tailored to groups. Topics include building code requirements, state and national regulations, state programs unique to flood plain management, and responsibilities of local governments, lending institutions, citizens, etc. The central theme of these workshops is the reduction of vulnerability to flooding. (Hosek 1995) The committees occur infrequently and only at the request of the interested party.

The MDNR also distributes to local government the Flood Mitigation Resource Guide. This publication explains duties and responsibilities of building inspectors, the National Flood Insurance Program (NFIP), construction codes, flood resistant building techniques and materials. This is considered fundamental material for building code inspectors and local governments. (Hosek, 1995) The Structural Mitigation Educational Manual is also distributed by the MDNR. The Structural Mitigation Education Manual provides information on how local communities can initiate the flood hazard mitigation planning process.

The purpose of the Flood Mitigation Resource Guide and the Structural Mitigation Educational Manual is to continuously update local governments on changing legislative requirements and opportunities to implement mitigation. It is important for local governments to understand that a key actor in flood mitigation is the building code inspector and other code professionals. Both of these publication emphasize this fact. Building code inspectors and other code professionals ensure that existing and new buildings built within a flood plain

meet state and Federal construction standards. One major issue concerning Michigan building code inspectors is the perceived lack of enforcement and knowledge about the different building codes that govern Michigan communities.

Having to work in a climate of political pressure, changing building code requirements and new federal flood plain regulations, state and private inspectors came under fierce criticism. Critics claimed inspectors were improperly trained and generally incompetent. Therefore, state law was enacted to improve competence. With the enactment of Act 54, Building Officials Registration Act in 1986, all building code inspectors must be registered and continue training every three years throughout their careers. There are presently 2,600 registered inspectors and 80 state inspectors in Michigan. The inspectors' main objective is to ensure that "...all buildings or structures erected in a flood hazard zone shall be elevated so that the lowest floor is located at or above the base flood elevation. All basement floor surfaces shall be located at or above the base flood elevations." (Section 2101.6.3.1 of the 1990 editions to BOCA) Still in question however, is the extent to which this requirement and other requirements are actually being enforced. (Sisco, Lehman 1995)

Multi-Disciplinary Committees, education and assistance to local governments and the development of educational manuals and other materials point to the state government's contributions to developing educational opportunities for emergency management professionals and local government officials. These efforts, however, do not fully satisfy the NAPA criteria. The state has not extended its educational opportunities to the urban planning and academic community.

The inability to obtain direct support from the planning community is one of the greatest weaknesses in Michigan's efforts to mitigate flooding. Mitigation

planning is a local initiative and can best be achieved if incorporated into existing administrative processes. The best place to do this is by incorporating mitigation techniques into the comprehensive or capital improvement plans that direct a communities growth and building codes. Doran Duckworth, the Hazard Mitigation Officer for the state of Michigan, works with planners in developing disaster plans for counties. It is his experience that planners are not as closely linked to flood mitigation planning as desired. Duckworth states "The planning community is generally un-aware of disaster management planning and especially flood hazard mitigation." He poses the following question to illustrate this fact as well as to show the state's lack of understanding of how to incorporate the urban planning community:

> The urban planning community has an important role to play in reducing or eliminating hazard vulnerability through prudent land use/development decision making, yet by and large, they are unaware of the relationship between sound land use planning and reduction of hazard vulnerability. Because the problem is nationwide in scope, it seems that some type of consistent national level effort should be taken to increase the understanding of urban planners about the nature of the problem. What steps can FEMA and the states take to institutionalize the concept of hazard vulnerability reduction into the land use/development decision making process so that it is a basic factor considered in all land use/development decisions made in this country? What role does the planning community have in the development of a comprehensive, multi-hazard mitigation plan recommended under the National Mitigation Strategy (Duckworth 1995)?

It is evident that the state is grappling with the question of how to capitalize and fully utilize community planners. The urban planning field is not involved in the field of disaster management planning nor is the field presently involved in flood mitigation planning on a large scale. Yet, a problem lies in that while the state's role in flood hazard mitigation planning is to provide the resources and direction to local governments, it is at the community level where

flood mitigation planning is fully developed and implemented. State government needs to develop training and provide information about flood hazard mitigation planning for community planners and academics.

Criterion Four: Research and Application

The state of Michigan is not encouraging research and the application of research in the field of flood hazard mitigation. This fact can be directly linked to the state's lack of action in engaging the academic community in the flood hazard research. Currently the state relies on publications from intergovernmental sources to help direct and shape their programs. This type of dependence on other state publications yields a recycling of ideas rather than an infusion of new ideas. The publications, while acting as good case studies, leave little room for the imagination that could spur bold steps. An argument could be made that academic research could provide that catalyst.

There is no real effort to step beyond the use of intergovernmental sources and utilize academic research. This has serious consequences for the advancement of flood hazard mitigation. The inability to engage the disciplines limits both the academic and practitioner. It limits the quality of the state's capability to mitigate flooding and the academics ability to test theory and study a policy issue that is dynamic and controversial.

Criteria Five: Peer Exchanges and Mutual Aid Agreements

The state has taken many initiatives in building intergovernmental relationships and relationships with various professional associations and organizations. These efforts satisfy the NAPA criteria. The Department of Transportation has developed committees with members consisting of state employees to investigate and develop criteria for bridges and road re-construction after a disaster occurs. The MDNR voluntarily informs a local government when permits are issued. This helps keep the local government

informed of potential activities in hazardous areas. Michigan is a member of the National Association of Flood Plain Managers which is a consortium of private and state flood plain managers. The purpose of the group is to expand the knowledge of flood plain management practices and techniques. (Hosek, 1995) The MDNR also participates in the Multi-Objective Management program (MOM).

The Multi-Objective Management program is made up of various state associations. MOM's main emphasis is to produce benefits for property owners, local officials, wetland managers, the general public, flood plain managers and fisheries and wildlife managers while reducing flood vulnerability. Goals of the program include reducing flood damage, improving property values, water quality, water supply, habitat, property value and economic base and increasing tourist activity, recreational opportunities, and species diversity. These broad goals are being achieved by initiating local level support in order to identify local problems, needs and specific local area goals. Plans are then developed to best meet the identified needs and goals. (Hosek, 1995)

The benefits of peer exchanges and mutual aid agreements is a sharing of information and sounder problem solving. It also extends the scope of mitigation and expands it into areas, such as financing, that could significantly contribute to capability development. The current efforts however, only encompass groups with similar interests. While these associations are commendable other interactions should be occurring. For example, communication with public and primary schools, civic leaders and the professional planning community would greatly enhance flood mitigation efforts. While additional initiatives are recommended the state has satisfied the criteria which evaluates whether the state is taking action to build

intergovernmental relationships and relationships with various professional associations and organizations.

Criteria Six: Regional Planning and Preparedness Efforts

During the 1970's when the nation saw the birth of federal legislation under the Nixon and subsequent administrations, Michigan followed suit with its own flurry of environmental activity. These acts represent the results of efforts to implement environmental protection but, by taking a regional approach to environmental protection, Michigan successfully laid out goals consistent with those of flood hazard mitigation planning. Michigan environmental legislation have made perhaps the greatest contribution towards flood hazard mitigation. The contributions came from not only the paradigms that these laws spun but also the action that the implementing programs generated. The Shorelands Protection and Management Act, the Natural Resources and Environmental Act, Natural River Act, P.A. 231 of 1970, Inland Lakes and Streams Act, P.A. 253 of 1972 and the Michigan's Goemaere Anderson Wetland Protection Act, P.A. and their associated state programs all contribute to reducing the state's vulnerability to flooding. These include: acquiring land along river corridors, implementing river management districts that allow for the use of overlay zones and flood plain zoning on a regional scale, establishing and enforcing anti-obstruction water way rules, and instituting 60 year setback requirements along shorelines. (See Appendix C for more information about each law and how it contributes to flood hazard mitigation.)

One significant attribute of these laws is that they address earlier regulatory inadequacy. For example, under the zoning enabling legislation of cities, counties, towns and villages (County Rural Zoning Enabling Act, P.A. 183, 1943, Township Rural Zoning Act, P.A. 184, 1943, City or Village Zoning, P.A. 207, 1921), broad enabling authority to regulate for health, safety or welfare

including special flood mitigation language was established. Section 289.638,639 of the City or Village Zoning Act states that cities, counties, towns and villages were required by 1975 to zone " flood, high risk, erosion areas and environmental areas along the Great Lakes and connecting waterways." This authority granted to local governments made zoning for flood hazard areas a requirement. However, zoning a flood area does not mean that the area is restricted from development nor that the type of development must meet certain flood proofing standards. This omission makes the law only partially useful to local governments wishing to regulate the type of development that occurs within a flood plain. But, with the passage of the previously mentioned Natural Resources and Environmental Act this loophole was closed.

Chapter 5
DISCUSSION

My hypothesis that the state of Michigan would satisfy the NAPA capability assessment criteria was not supported. The results of my study indicate that only two of the six criteria were wholly satisfied. To review, the two criteria satisfied are: state fostering of peer exchanges and mutual aid agreements and state encouragement of regional planning and preparedness. Unsatisfied criteria include the development of a strategic flood hazard mitigation plan, development of financial incentives for community wide flood mitigation projects, training of local and state officials about flood hazards and encouragement of research and the application of the research.

The state should meet the unfulfilled criteria in order to continue to build capabilities for flood reduction purposes. The initial undertaking required to achieve compliance with the NAPA criteria is the completion of a strategic plan for upgrading state and local government capability. This plan should be developed with the contributions and comments of state agency personnel, local government, building codes inspectors and community planners. In addition, plan acceptance and political support by these actors is mandatory. Literature shows there is little political support for non structural mitigation and the use of government-subsidized hazard insurance. (Rossi, et. al. 1982) The literature also shows that there are administrative, economic and federal government

intervention constraints that make development of a comprehensive mitigation plan difficult. (Petak and Atkisson, 1982) The state government must address these issues in order to ensure successful development of the flood mitigation plan. The state must also develop further regulatory authority such as inspection criteria for high risk areas and state demarcation of hazard zones.

These are hefty objectives that will require concentrated efforts by state, regional and local leaders. For the plan to be effectively implemented a governing approach would have to be devised that ensured plans developed at the state, regional and local level coincided in fundamental principle and purpose. An ideal system would be for the state government to develop a flood hazard mitigation plan (or perhaps a multi-hazard mitigation plan addressing all hazards threatening Michigan residents) that set the policy framework by which the state was prepared to follow to mitigate flood hazards. This plan would address both structural and non-structural issues. While broad in scope, the plan would address the fundamental paradigm of reducing the state's vulnerability to flooding. More specific plans would be developed at the regional level. The regional bodies, partially made up of local government representatives, could establish region specific plans that take into account the unique aspects associated with the area. Regional plans would coincide with the state plan but would be more specific. The regional plan should implement specific non-structural mitigation actions such as regional land use policy that direct development away for an identified flood hazard.

While I envision regional bodies to be the primary actors in developing flood hazard mitigation plans local governments would be key actors. Consensus building with regard to plan goals and objectives is essential for successful plan implementation. In order to build consensus local government leaders would be asked to form a regional planning committee. These

committees would develop the regional flood hazard mitigation plan with special emphasis on making sure the plan does not undermine local planning initiatives. In other words, the regional flood hazard mitigation plans would consist of goals and objectives that coincided not only with state flood mitigation policy but also with local comprehensive plans.

Regional and local government participation is fundamental to flood mitigation efforts. The state has not yet developed financial incentives to strategically reward mitigation efforts and encourage further competent performances within the state and local government. Doing so would begin to entice more participation in planning for mitigation. This type of initiative would also aid in successful plan implementation. Flood mitigation efforts can be costly and beyond the budgets of many local governments. These funds would help subsidize flood mitigation projects. Funds would help pay for local government acquisition projects, modification of flood prone structures, development of zoning and flood plain regulations, relocation assistance, flood proofing and community awareness campaigns. Funds would also contribute to state government assistance to communities such as warning and forecasting flood prone conditions, loans, grants, education and public information. Funds spent now can reduce cost by providing long term protection from devastating flooding disasters.

Successful plan development, implementation and funding hinges on state and local government education and awareness about the positive aspects of flood mitigation. During the course of the interviews for this study it became apparent that the interviewees were not aware of how department actions contributed to the capability of the state to mitigate flooding. In many cases the interviewee came to a realization during the course of the interview that there were either no actions being taken to contribute to capability or there were many.

Often the lack of initiatives to mitigate flooding was a surprise to the interviewees. Perhaps this lack of awareness about Michigan's risk to natural hazards and what can be done to reduce risk also exists at the local level. A study should be conducted in order to determine the extent of awareness that exist among local officials.

It can hypothesized that Michigan's vulnerability to flood disasters is only a cognitive threat in the minds of local government officials when the disaster has already occurred. When media, political and public awareness concerning the vulnerability to flooding is high, then mitigation measures are supported. However, when the flood waters recede and the housing reconstruction has been completed, media attention, public and political support draws to a close. (Duckworth, 1995) Public awareness, education and training of academics, state and local planners, politicians and emergency management personnel needs to be ongoing and institutionalized within existing training modalities. Mitigation can be incorporated into land use courses, building code seminars and conferences about environment risks. While the state is currently providing educational opportunities to emergency management personnel they still need to target community planners, local government and the academic community.

A lack of education and awareness to the academic community has led to a non-existent relationship between those groups working on flood mitigation issues in the state of Michigan. While members of the academic community are researching flood mitigation that research is not being encouraged by the state nor is the research being used by the state. A relationship needs to be built between academics and emergency management personnel so that research can be transformed into practical applications. This will benefit the emergency management profession by breeding new ideas into the format of emergency management. It will also benefit the academic community by illustrating the

practicality of theory and research concerning flood mitigation. Joint conferences and computer conferences, such as Delphi, would help begin to illicit research ideas and application of the research.

These recommendations were conceived by studying the capabilities within the state government and how they compare to the performance criteria developed by NAPA for the US Congress and the FEMA. They are not the only factors the state should consider when developing capability, but they are considered primary to any effort that is undertaken to mitigate flooding. Additional department specific recommendations can be made to increase the state's capability. For example, the Department of Public Health is not involved in developing flood mitigation capabilities. (Kralapp, 1995) They need to develop stricter sanitary codes, storm water management and land treatments. In addition, hospitals need to assess their vulnerability and take steps to reduce exposure to risk. These recommendations are needed to ensure flooding disasters do not cause unsanitary situations or a lack of health care facilities in flood inundated areas.

The Department of Management and Budget, Risk Management Unit, is not evaluating the risk of natural hazards because of a perceived lack of importance to Michigan's economic prosperity. (Swisher, 1995) The Michigan Jobs Commission, who oversees federal and state mortgages, has no mitigation standards or criteria in home purchasing and rehabilitation except state building codes. (Patsula, 1995) Criteria for home purchasing in flood risk areas need to be developed in order to provide additional safe guards to the home owner. The Department of Natural Resources does not have a permitting requirement for housing development around inland lakes. (Hosek, 1995) This yields development in flood risk areas and increases Michigan's vulnerability to flooding disasters. Because of its need to locate along major trunk lines, the

Department of Corrections realizes the risk of natural hazards but is restrained in their choice of facility location because of a lack of statutory support allowing for location in risk free zones. (Walters, 1995) Not only inmates are at risk to flooding hazards, facility staff are required under law to stay at the facility during a natural disaster. The Department of Labor, while initiating further educational requirements for building code inspectors, have a decreasing budget, limited staff and little enforcement power to ensure building code inspectors are doing their job adequately.

Recommendations can also be made that extend or contribute to the literature concerning capability development of flood mitigation. The literature shows that it is important to extend disaster research from an emphasis on structural mitigation. It has been suggested that additional flood hazard capability assessment criteria is needed. (Mitchell, 1990) As a result of this study I feel two additional criteria should be developed that address policy taxonomy and institutional coordination.

One aspect neglected by the NAPA criteria is an evaluation of the regulatory and policy posture of flood mitigation. It does not seek to evaluate Michigan's flood mitigation policy. There are ten different types of policies that Michigan might have: action-forcing, attention focusing, disaster recovery, technology development, technology transfer, regulatory, investment and cost allocation, system management, system optimization or direction action policies. (Petak and Atkisson, 1982) Determination of the policies Michigan has adopted would indicate where additional capability needs to be developed.

Reflection on policy type leads to a greater awareness of additional policy opportunities that might not have been realized. This process could lead to more successful implementation of more controversial flood hazard mitigation attempts. For example, the state relies on regulatory mechanisms to keep people

from developing on riverine flood plains and shoreline high risk erosion and flood areas. The state has tried and failed to develop a statewide setback regulation for all new homes built along the shoreline. Understanding that there are different policies not being utilized may advance the implementation of a statewide setback for shoreline areas because understanding that a combination of policy actions may be more appropriate. Knowing this may suggest alternatives to prohibiting development of riverine and shoreline flood plains that are not as politically controversial or so difficult to implement. Therefore, the criteria should address the different types of flood mitigation policies at work and the opportunity to take advantage of additional policy types.

In addition to understanding the policies used to mitigate flooding, a criterion also should address where the responsibility and authority for flood hazard mitigation lies. A study of the extent of coordination occurring within the Michigan state government would suggest that responsibility is primarily in the hands of the Flood Management Unit, Shorelands Management Section and the Emergency Management Division. The Flood Management Unit is concerned with reducing riverine flooding. The Shorelands Management Section is concerned with reducing shoreline erosion and high flood prone areas. The Emergency Management Division coordinates all emergency management activities within the state.

These three groups are currently not working on joint projects nor are they coordinating activities. This greatly undermines the state's ability to use limited resources wisely. What is needed is the responsibility and authority for flood hazard mitigation to emanate from one government unit to avoid a waste of human and financial resources and other missed opportunities. The responsibility of this newly developed section may be to simply coordinate all other activities. But, this would eliminate the fragmentation in the development

of capability that seems to presently exist. As this study has identified, mitigation is occurring in a very fragmented, undirected manner. This loosely fit consortium of mitigation capabilities is what James LeeWitt, director of FEMA, labels a 'patch-work quilt' of capabilities. This loosely fit and poorly planned development of capabilities leaves little emphasis on developing one coordinated state mitigation program with the expressed purpose of identifying, developing and planning flood hazard mitigation capabilities. In other words, loosely conceived and managed mitigative capabilities leads to loosely conceived and managed efforts to reduce flood vulnerability. Any plan developed by the state should address the need for one unit of government that holds the responsibility and authority for flood hazard mitigation.

The likelihood that the state will develop a new unit of government for the expressed purpose of natural hazard mitigation is unlikely. Within the past year the state has seen the dismantling of the Department of Natural Resources into two separate entities, the Department of Environmental Quality and the Department of Natural Resources, with hopes of streamlining operations and reducing staff. In addition, major departments such as the Department of Commerce and Public Health are currently under reorganization and consolidation. Therefore, the current system of flood hazard mitigation planning characterized by individual initiatives of various departments will persist. The current fragmentation and uncoordinated efforts over time will contribute to unwise practices along riverine and shoreline lands. This will only increase the state's vulnerability to flooding disasters and missed opportunities to develop capabilities within state department practices.

One of the most underestimated threats in society are natural disasters. Frequency, magnitude and force which drives a natural disaster is often underestimated. There exists a misconception that all natural hazards are

disasters waiting to occur. This is the largest misconception surrounding the understanding of flood hazards. Disasters are not natural. (Cannon 1994) A hazard only becomes a disaster when it affects vulnerable people. Therefore, a reduction of vulnerability through flood mitigation planning is an important aspect to state and local government flood prevention activities. Community planners in particular should be interested in flood mitigation so that continued economic, social and environmental prosperity occurs for their communities even in the face of severe weather. As a reflection of the understanding that flood disasters can be curtailed it was anticipated that this study would yield complete agreement with the NAPA criteria designed to evaluate and augment capability. In other words, it was expected that the state of Michigan government was undertaking a comprehensive effort to mitigate flood hazards. Instead the study shows that many opportunities still exist to develop capabilities.

With the understanding that flood mitigation can be used as a preventive tool to eliminate disasters, flood mitigation will continue to be an important resource in managing the state. However, how coordinated and efficient the effort is to build capabilities and utilize existing resources to reduce vulnerability will depend on the state's initiatives in meeting the NAPA criteria.

APPENDICES

APPENDIX A

Appendix A

INTERVIEW QUESTIONS

Date_____

Time_____

Name of interviewee_____

Title of interviewee_____

Department_____

Address_____

Phone Number_____

Flood hazard mitigation is a strategy that protects people or property from losses due to flooding events. Flood hazard mitigation can reduce the severity of the affects of a flood disaster by reducing the cause or occurrence of the hazard, reducing exposure to the hazard, or reduce the effects through preparedness, response and recovery measures.

1. What is your department's responsibilities and how do the activities and programs of your department serve to decrease vulnerability to hazards? Include information about hazard mapping or identification, regulation of development, funding of housing or infrastructure, development of codes or standards, public education, etc.

2. Do the responsibilities listed in #1 act to increase or decrease the potential for future losses to flood disasters in the state of Michigan?

3. What Federal, state, local or private agencies, associations or organizations does your department work with in employing efforts to decrease vulnerability to flood hazards?

4. Are existing statutory authorities, statues, and regulations adequate to ensure that your department can protect people and property from losses to natural disasters? If authorities, statues and regulations are currently inadequate, how might they be expanded so as to assist your department's efforts in decreasing vulnerability?

5. Does your agency have any programs or capabilities specifically designed to reduce potential losses from flood disasters?

6. Does your agency have written policies or procedures designed to reduce losses from flood disasters?

APPENDIX B

Appendix B

INTERVIEW LIST

•Bureau of Construction Codes, Department of Labor

•Plan Review/Building Division, Building Codes, Bureau of Construction Codes, Department of Labor

•Resource Protection Section, Department of Natural Resources

•Public Finance Programs, Michigan Strategic Fund, Department of commerce

•Physical Plant Division, Department of Corrections

•Environmental Assistance Division, Department of Natural Resouces

•Mental Health Services Section, Division of Health Facilitiy Licensing and Certification

•Emergency Management, Department of Transportation

•Traffic Safety Eduction and Management Program, Department of Eduction

•Design Division of the Office of Facilities, Deparmtnet of Management and Budget

•Community Development Services, Michigan Jobs Commission Development Division, Department of Commerce

•Subdivision Control Unit, Property Development Division, Department of Commerce

•Risk Management Division, Department of Management and Budget

•Construction and Facilities Management Office, Department of Military Affairs

•Flood Hazard Management Unit, Department of Natural Resources

- Natural Rivers, Department of Natural Resources
- Shorelands Management Unit, Department of Natural Resources
- Farmland and Open Space Unit, Department of Natural Resources

APPENDIX C

Appendix C

LEGISLATION

The Natural River Act, P.A. 231 of 1970

The Natural River Act, P.A. 231 of 1970 was enacted to protect the natural features of Michigan rivers by designating part or all of a river a Natural River in order to establish a system of outstanding rivers in Michigan, and to preserve, protect, and enhance their wildlife, fisheries, scenic, historical, recreational and other values. The Natural Rivers Section of the DNR is granted the authority to implement the Act. Implementation occurs by categorizing rivers based on certain criteria related to the natural features surrounding the river and then using land use controls, such as zoning, condemnation, acquisition, to regulate the land adjacent to the river. Rivers protected by the Natural Rivers Act are considered either a Wilderness River, Wild Scenic River or Country Scenic River. The major contributor to flood mitigation capability is designation and zoning of land adjacent to a Natural River. In order to designate a river, the Act gives the DNR the authority to initiate the preparation of a Natural River Plan that provides direction for development of land adjacent to the designated river. The intent of the Natural Rivers Act aids in locking particularly hazard prone areas inaccessible to development while still allowing public enjoyment of the river. This regional approach assumes that land use in one part of the river will affect land owners in other parts. (Holt, 1995)

The Local River Management Act, P.A. 253 was enacted in 1964 to coordinate planning between local units of government in order to carry out a coordinated water management program. Implementation of the water management program occurs via the establishment of watershed councils. These councils conduct studies on watershed problems, water quality and the types of use occurring within the watershed. Two very prominent and active watershed councils are the Tipp of the Mitt Watershed Council which oversees rivers located in the northern lower peninsula and the Huron River Watershed Council which operates within the southeastern lower peninsula watershed. Watershed councils have the authority to develop River Management Districts for the purpose of acquisition, construction, operation and the financing of water storage and other river control facilities necessary for river management. A River Management District is an important planning tool as it allows planners the latitude to initiate innovative land use planning techniques such as overlay zones or flood plain zoning on a regional scale. The provision to allow acquisition of land adjacent to the river for the purpose of management aids in regulating development of land particularly prone to flooding. The clear language of the stipulation provides the forum needed to initiate controversial land acquisition proceedings with statutory support. (Pearson, 1995)

Inland Lakes and Streams Act, P.A. 346 of 1972.

Regulation of all construction, excavation, and commercial marina operation on the state's inland waters is provided for in the Inland Lakes and Streams Act, P.A. 346 of 1972. This Act ensures that proposed actions do not affect inland lakes, streams, connecting water and the uses of all such waters. Prohibition of structures that interfere with the natural flow of inland lakes or streams is one main provision of the Act. This provision aids in protecting the lake or stream from structures that enlarge, extend or diminish inland lakes or

streams. In the event of a severe storm, structures within the water can contribute to flooding. Prohibiting structures that obstruct the flow of water helps to protect property from flooding damage.

Michigan Goemaere Anderson Wetland Protection Act,

With the understanding that wetlands are important ecological entities which also naturally help control flooding occurrences, the Michigan Goemaere Anderson Wetland Protection Act, P.A. 455 was passed. This Act provides for the preservation, management, protection and use of wetlands. In order to accomplish this, permits are required to alter certain wetlands. The development of a plan for the preservation, management, protection and use of wetlands is also required. In addition, the Act provides for remedies and penalties in order to enforce the provisions of the Act. Wetlands in Michigan are defined as land characterized by the presence of water at a frequency and duration sufficient to support wetland vegetation or aquatic life. This includes a bog, swamp or marsh or any water continuous to the Great Lakes, an inland lake, pond, river or stream, 5 acres or more in size. Special designation may be given to areas not contiguous to a body of water less than 5 acres in size if the department determines that protection of the area is essential to the preservation of the natural resources of the state. This Act, among other criteria, finds that the management and preservation of wetlands are important for flood and storm control because of the hydrologic absorption and storage capacity of the wetland. Both are essential natural aspects to flood disaster reduction.

Shorelands Protection & Management Act, P.A. 245 of 1970

The key law and program that effects shoreline flood vulnerability reduction is the Shorelands and Protection & Management Act, P.A. 245 of 1970. The purpose of the Shorelands Protection & Management Act is to provide for the protection of designated environmental areas, flood risk areas and high risk

erosion areas susceptible to damage from various land use activities along the Great Lakes shoreline. State authorized mechanisms established to fulfill this purpose are zoning ordinances, studies, plans and remedies for the violation of rules. This Act gives the DNR the authority to identify and regulate areas considered at risk to erosion and flood. The Act also provides for the protection of environmentally sensitive areas through the use of setbacks, zoning and building code standards. In addition, permits are required for any new permanent structure on a parcel of land in a designated flood risk area and for the erection, installation or moving of permanent structures on a parcel of land which is in a designated high risk erosion area.

In fulfillment of the Acts mandate, studies have been conducted by the Great Lakes Shoreland Section, DNR, the implementor of the Acts provision, that identify areas particularly susceptible to erosion, flooding and environmental degradation. These areas are carefully monitored and regulated in order to prevent serious environmental degradation that would contribute to flooding and erosion. The Shoreland Section does not issue permits but permitting for various activities in the designated area is administrated by the local government and have to meet standards pursuant to the Act and Administrative rules. One such standard is building construction codes. As Rule 4(10) states: "New residential structures in a flood risk area shall be elevated so that the lowest portion of all horizontal structural members which support floors...is located at or above the 100-year flood elevation.." This is a heightened standard as compared to the state Construction code and other nationally recognized codes such as BOCA.

With an understanding that more could be accomplished to reduce shoreline flooding vulnerability the Great Lakes Shorelands Section actively worked to develop and pass more stringent setback requirements for designated

erosion areas and increase building standards in flood areas. This campaign proved successful with the passage of the 1992 Amendments to the Administrative Rules of the Shorelands Protection and Management Act. Two provisions that substantially strengthened the Administrative rules were the more stringent standards for buildings in the designated flood areas and the addition of the 60 year setback requirements for non-readily movable structures in erosion areas. Specifically the rules state that in designated erosion areas residential structures 3,500 square feet or less have to be constructed or retrofitted so that they can be easily moved and structures greater then 3,500 square feet do not have to be easily moved but do have to be built to withstand flooding. In addition, non-readily movable structures must be located at the 60 year setback while readily movable structures may be located at the 30 year setback.

Furthermore, raised standards were set for non-residential structures as well. As Rule 2(2) and 4(11) states: "Rule 2 (2) The department shall designate a high-risk erosion area upon its finding that recession of the landward edge of the zone of active erosion has been occurring at an average annual rate of 1 foot or more pre year...The projected recession distance shall be based on a projected 30-year period of recession for small permanent structures and a projected 60-year period for large permanent structures." "Rule 4(11)New nonresidential structures in a flood risk areas shall be in compliance with either of the flooding requirements: (a) Meet the requirements of new residential structures as provided for in subrule (10) of this rule."

In designated flooding areas a one foot freeboard to the lowest floor requirement for all structures within the 100 year flood plain was added. This construction standard is for structures already occupying the flood plain and required the homes be retrofitted to withstand flood waters. The strict language

of the Act and the aggressive nature in which the Great Lakes Shoreland Section carries the laws mandate out has contributed to a substantial improvement in shoreline vulnerability reduction. (Holt, 1995)

The Natural Resources and Environmental Act, P.A. 451 of 1994

The Natural Resources and Environmental Act is one of the most prominent laws to address riverine flood plains directly. Enacted to protect Michigan's environment and natural resources, this Act revises and consolidates laws relating to protection of the environment and its resources in the state. One of the primary emphases of the Act is the prohibition of flood plain inhabitancy. The Act also regulates discharges into state waters and sets pollution standards. Section 3108 states that "A person shall not occupy or permit the occupation of land for residential, commercial, or industrial purposes or fill or grade or permit the filling or grading for any purposes other than agricultural of land in the flood plains, stream bed, or channel of any stream...unless the occupation, filling, grading, or other activity is permitted under this part." This is an important aspect for alteration of the flood plain can significantly contribute to greater flooding disasters.

This law is perhaps the most direct mandate to local governments regarding flood plain regulation. In essence, there should be no new construction within a flood plain without proper permit approval from the DNR. Whether permits are being sought after is a major issue in flood plain management in Michigan. (Hosek, 1995)

Dam Safety Act P.A. 300 of 1989

One factor that significantly increases the devastation of unusually high water accumulation is dam failure. In the best case scenario, dams aid in protecting against flooding. When it cannot withstand water levels usually associated with disaster level water tables a poorly constructed dam will breach.

The resulting consequence is property damage to downstream inhabitants. Because of the number of dams in Michigan, dam failure is of particular concern in the state. In 1989, the Dam Safety Act P.A. 300 was enacted to reduce the number of dam failures and the resulting damage that occurs thereafter. This Act is administered by the Dam Safety Unit within the Water Management Section of the DNR. The Dam Safety Unit has the primary responsibility to ensure dam safety within the state.. Their duties include issuing permits, approving plans and inspecting dams. Part of the Dam Safety Units duty is to inspect dams and mandate the removal of unsafe dams. Section 39(1) of the Dam Safety Act state: "Where significant damage to the public health, safety, welfare, property and natural resources or the public trust in those natural resources occurs as a result of the condition or existence of a dam, the department may order the removal of the dam."

Permits for new dam construction or additions and improvement to older dams are also required from the Dam Safety Unit in order to ensure the appropriateness of a proposed action or dam site. In addition, the Act requires the preparation of three different plans for new and old dams: Engineering Plans, Emergency Action Plans and Conceptual Plans. Part of the plan includes an assessment of the known existing and potential adverse effects the project will cause, including significant effects on the public health, safety and welfare. The Act also sets up a classification system for dams. Dams are rated as either high, significant or low. The classification system is based on the downstream impact if the dam were to fail. Retention or detention basin impounding more than five acres and with a height of six or more feet are also required of every dam. If dams do not meet the standards set by the inspection criteria the state can require the dam to be dismantled.

In order to ensure compliance with the Act, inspection by the DNR of all dams within the state is required. Tools utilized to enforce this Act include civil action, imprisonment or fines. The inspection provision of the Act has significantly aided in reducing the threat of dam failure. (Dexter, 1995)

BIBLIOGRAPHY

BIBLIOGRAPHY

Aguirre, Benigno E. 1993. Collective Behavior and Social Movement. In *Disasters, Collective Behavior and Social Organization,* edited by Russell R. Dynes and Kathleen J. Tierney. Newark: Universityof Delaware Press.

Applied Environmental Research. 1976. *Michigan Guide to Performance Controls for Great Lakes Shorelands.* Lansing: Division of Land Resource Programs.

Bates, Fredrick L. and Pelanda, Carlo. 1993. An Ecological Approach to Disasters. In *Disasters, Collective Behavior and Social Organization.*, edited by Russell R. Dynes and Kathleen J. Tierney. Newark: Universityof Delaware Press.

Beckeer, William S. 1979. *Come Rain, Come Shine: A Case Study of a Flood Plain Relocation Project at Soldiers Grove.* Wisconsin: Department of Natural Resources.

Burby, Raymond J. and French, Steven. 1981. Coping with Floods: The Land Use Management Paradox. *Journal of American Planning Association* 47: 289-300

Charles, Michael T. and Kim, John Choon K. Kim. 1984. *Crisis Management: A Casebook.* Illinois: Charles C. Thomas.

Cigler, Beverly A. and Burby, Raymond J. 1990. Local Flood Hazard Management Lessons from National Research. In *Cities and Disaster: North American Studies in Emergency Management*, edited by Richard T. Syles and William L. Waugh, Jr. Illinois: Charles C. Thomas Publisher.

Cooke, G. Dennis, Welch, Eugene B., Peterson, Spencer A., and Newroth, Peter R. 1993. *Restoration and Management of Lakes and Reservoirs.* 2nd ed. Boca Raton: Lewis Publishers.

Drabek, Thomas E. and Hoetmer, Gerald J. ed. 1991. *Emergency Management: Principles and Practice for Local Government.* Washington, D.C.: International City Management Association.

Dynes, Russell R. and Tierney, Kathleen J. 1994. *Disasters, Collective Behavior, and Social Organization.* Newark: University of Delaware Press.

Emergency Management Division, Michigan Department of State Police. 1990. *Local Emergency Planning Guide.* EMD PUB-203.

Emergency Management Division, Michigan State Department of State Police. 1986. *Interagency Hazard Mitigation Report for Michigan.* FEMA-774-DR-MI.

Emergency Management Division, Michigan State Department of State Police. 1994. *Hazard Mitigation Grant Program Applicant Handbook.* EMD PUB-905.

Emergency Management Division, Michigan State Department of State Police. 1992. *Michigan Hazard Analysis.* EMD PUB-103.

Engineering-Water Management Division, Michigan Department of Natural Resources. 1986. *Flood Hazard Mitigation Plan for September 1985 Flood Disaster in Michigan.* FEMA 744-Dr-MI.

Federal Emergency Management Agency. 1990. *Disaster Assistance Programs: A Guide to Federal Aid in Disasters.* FEMA DAP-19.

Federal Emergency Management Agency. 1992. *Emergency Preparedness U.S.A.* FEMA HS-2

Federal Emergency Management Agency. 1989. *Home Study Course: The Emergency Program Manager.* HS-1

Federal Emergency Management Agency. 1990. *Post-Disaster Hazard Mitigation Planning Guidance for State and Local Government.* FEMA DAP-12.

Federal Emergency Management Agency. 1995. *Quick Facts: National Flood Insurance Program.* Unpublished report.

Flood Disaster County Road Association of Michigan. 1986. *Flood Mitigation Report.* Unpublished report.

Godschalk, David R., Brower, David J.and Beatley, Timothy. 1989. *Catastrophic Coastal Storms: Hazard Mitigation and Development Management.* Durham: Duke University Press.

Goodman, Alvin S. 1984. *Principles of Water Resources Planning.* New Jersey: Prentice-Hall, Inc.

Great Lakes Commission. 1987. *Great Lakes Shore Erosion and Flooding Assistance Programs.* Ann Arbor: Harbour House Publishers.

Hale, A.R. 1990. The Human Element in Disasters. In *Disaster Prevention, Planning and Limitation.,* edsited by A.Z. Keller and H.C. Wilson. England: Letchworth.

Hood, Christopher and Jackson, Michael. 1992. The New Public Management: a recipe for disaster? In *Hazard Management and Emergency Planning: Perspectives on Britian.* edited by Dennis Parker and John Handmer. London: James and James Science Publishers Ltd.

Kafiluddin, A.K.M. 1991. *Disaster Preparedness for Bangladesh Floods and Other Natural Calamities.* University of Bangladesh.

Kirby, Andrew. 1990. On Social Presentations of Risk. In *Nothing to Fear: Risks and Hazards in American Society.,* edited by Andrew Kirby. Tucson: University of Arizona Press.

Leopold, Luna B. and Maddock, Thomas Jr. 1954. *The Flood Control Controversy: Big Dams, Little Dams, and Land Management.* New York: The Ronald Press Company.

Lindell, Michael K. and Perry, Ronald W. 1992. *Behavioral Foundations of Community Emergency Planning.* Washington: Hemisphere Publishing Corporation.

Manerey, P.E. and Kinzley, Kirstin. 1988. *Flood Hazard Mitigation Handbook.* Michigan Department of Natural Resources.

Maskrey, Andrew. 1990. Disaster Mitigation as a Development Tool. *The Futurists.* 24(September).

May, Peter J. and Williams Walter. 1986. *Disaster Policy Implementation: Managing Programs Under Shared Goverance.* New York: Plenum Press.

Merriam, Dwight H. and Lyman, Jeffery R. 1994. A Practical Guide to 'Substantially Advancing Legitimate Governmental Interest' with Dedications and Other Exaction. *Planning Michigan.* 7,5.

Michigan-American Planning Association, Planning Law Committee. 1994. *Suggested Outline for Unified Planning Enabling Legislation in Michigan.* Michigan: Michigan Chapter American Planning Association, Unpublished report. (September/October).

West Publishing Co. 1979. *Michigan Compiled Laws Annotated.* St. Paul Minn.: West Publishing Co.

Michigan Department of Natural Resources. 1981.*Clinton River Basin Stormwater Management Assessment 1981* Michigan Department of Natural Resources, Water Management Division. Unpublished report.

West Michigan Shoreline Regional Development Commission. 1980.*A Shorelands Planning and Zoning Study.* Unpublished report.

Michigan Department of Natural Resources, Land and Water Management Division. 1987. *Flood Hazard Mitigation Plan: September 1986 Flood Disaster.* FEMA 774-DR-MI. Unpublished report.

Milbrath, Lester W. 1994. Stumbling Blocks to a Sustainable Society. *Futures.* 2(March):26.

Mitchell, B., Gardner, J., Cook, R., and Veale, B. 1978. *Physical Adjustments and Institutional Arrangements for the Urban Flood Hazard: Grand River Watershed.* Ontario: Department of Geography, Faculty of Environmental Studies, University of Waterloo.

Mitchell, James K. 1990. Human Dimensions of Environmental Hazards: Complexisty, Disparity, and the Search for Guidance. In *Nothing to Fear* ed, edited by Andrew Kirby. Arizona: The University of Arizona Press, Mitigation Planning: Multi-Hazard Mitigation. *The Mitigator.* May 1994: 1.

Mileti, Dennis S. 1993. Public Risk Communication. In *Disasters, Collective Behavior and Social Organization..* edited by Russell R. Dynes and Kathleen J. Tierney. Newark: Universityof Delaware Press.

Mitchell, James K. 1988. Confronting Natural Disasters: An International Decade for Natural Hazard Reduction. *Environment.* (March):30.

Mitchell, James K. 1990. Human Dimensions of Environmental Hazards. In *Nothing to Fear: Risks and Hazards in American Society,* edited by Andrew Kirby. Tucson: University of Arizona Press.

Monday, Jacquelyn. 1983. *Evaluation of Local Flood Plain Management in the Tennessee Valley.* Colorado: Natural Hazards Research and Applications Information Center.

Moore, Jamie W. and Moore, Dorothy P. 1989. *The Army Corps of Engineers and the Evolution of Federal Flood Plain Management Policy.* Colorado: Program on Environment and Behavior.

Murphy, Francis C. 1958. *Regulating Flood-Plain Development.* Illinois: The University of Chicago Press.

National Academy Press. 1990. *Managing Coastal Erosion.* Washington, D.C.: National Academy Press.

National Association of Independent Insurers. 1994. *Mitigating Catastrophic Property Insurance Losses: A study with guidlines for disaster preparedness, catastrophic event management and loss mitigation.* National Association of Independent Insurers.

Palm, Risa I. 1990. *Natural Hazards: An Integrative Framework for Research and Planning.* London: The Johns Hopkins University Press.

Parker, Dennis J. 1995. Floods in Cities: Increasing Exposure and Rising Impact Potential. *Built Environment* 2,30: 21.

Petak, William J. and Atkisson, Arthur A. 1982. *Natural Hazard Risk Assessment and Public Policy: Anticipating the Unexpected.* New York: Springer-Verlag.

Platt, R. H. 1987. Flood Loss Reduction by Metropolitan Regional Authorities in the USA. In *Flood Hazard Management: British and international perspectives,* edited by John Handmer. Norwick: Geo Abstracts Ltd.

Popkin, Roy S. 1990. The History and Politics of Disaster Management in the United States. In *Nothing to Fear: Risks and Hazards in American Society.,* edited by Andrew Kirby. Tucson: University of Arizona Press.

Popper, Frank. 1988. Understanding American Land Use Regulation Since 1970. *Journal of the American Planning Association.* 2: 54.

Porter, Douglas. 1991. *State and Regional Initiatives for Managing Development: Policy Issues and Practical Concern.* Washington D.C.: Urban Land Institute.

Pueblo County Public Safety and Operations. 1994. *County of Pueblo Flood Hazard Mitigation Plan: The June 3, 1994 Flash Flood.* Colorado Department of Local Affairs.

Rossi, Peter H., Wright, James D., and Weber-Burdin, Eleanor. 1982. *Natural Hazards and Public Choice: The State and Local Politics of Hazard Mitigation.* New York: Academic Press.

Showalter, Pamela Sands and Myers, Mary Fran. 1992. *Natural Disasters as the Cause of Technological Emergencies: A Review of the Decade 1980-1989.* Colorado: Natural Hazards Research and Applications Information Center.

South Dakota. 1986. Department of Military and Veterans Affairs, Division of Emergency and Disaster Service. *South Dakota Hazard Mitigation Plan.*

Tarr, Joel A. 1990. Risks and Society: Some Historical Cases and Contemporary Comparisons. In *Nothing to Fear: Risks and Hazards in American Society.*, edited by Andrew Kirby. Tucson: University of Arizona Press.

Tempia, E. 1982. Water Problems and Land-Use Problems: Three Case Studies. In *Water Resources and Land-Use Planning: A Systems Approach,* edited by P. Laconte and Y.Y. Haimes. The Hague: Martinus Nijhoff Publishers.

The Building Official and Code Administrator. 1994. *Rain, Rain, Go Away. Come Again Another Day.* University of Wisconsin: Wisconsin.

U.S. Army Corps of Engineers. 1985. Buffalo District. *Flood Response, Advance Measures and Other Activities as a Result of Record Great Lakes Water Levels.*

U.S. Army Corps of Engineers. 1994. National Flood Proofing Committee. *Local Flood Proofing Programs.* Illinois: French and Associates, Ltd.

Wall, Glenn R. 1969. *Establishing an Engineering Basis for Flood Plain Regulations.* Tennessee Valley Authority.

White, Gilbert and Haas, J. Eugene. 1975. *Assessment of Research on Natural Hazards.* Massachusetts, MIT Press.

White, Gilbert. 1977. Comparative Analysis of Complex River Development. In *Environmental Effects of Complex River Development*, edited by Gilbert F. White. Colorado: Westview Press.

Winchester, Peter. 1992. *Power, Choice and Vulnerability: A Case Study in Disaster Management in South India.* London: James & James.