INTEGRATING FLOOD HAZARD MITIGATION AND WATERSHED PLANNING THROUGH REGIONAL INSTITUTIONAL APPROACHES: A RECOMMENDATION FOR THE TAR RIVER BASIN OF NORTH CAROLINA

by

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EXECUTIVE SUMMARY

In just one year, Governor Mike Easley of North Carolina directed over $350 million in federal and state funds toward citizens, businesses and public agencies that sustained property damages during the hurricane season of 2004.[1] These funds are assisting the recovery process not in the state's coastal areas, but in the mountains of western North Carolina where heavy rainfall and overflowing rivers caused most of the damages.

Flood hazard mitigation in communities with flood hazard risks or flood-prone areas can significantly reduce property damages as well as the emotional stress and long-term economic losses resulting from future flood events. Thus, hazard mitigation is a required element of sustainable communities. Reducing the potential for damages increases the resiliency of a community's members and its economy in the face of future disaster events. In regards to the environmental component of sustainability, the development of Gilbert White's concept for floodplain management, or non-structural flood hazard mitigation actions, emphasizes the natural and beneficial functions of floodplains, proactive approaches, and restoration and protection efforts that achieve broad environmental objectives into the future.

"With increasing reliance being placed upon non-structural measures such as land acquisition and land use regulation, the need for consistency among the policies and actions of local governments bordering a common stream is acute."[2] One jurisdiction's action in the floodplain will have impact—favorable or unfavorable—on jurisdictions downstream, across the river and even upstream. As a result, hazard mitigation actions implemented by local government or property

[1] North Carolina Office of the Governor website: http://www.governor.state.nc.us/. Last accessed April 14, 2005.
[2] Platt, Rutherford. 1980. Intergovernmental management of floodplains. Rutherford H. Platt, Ed. Program on Technology, Environment and Man, Monograph #30, Institute of Behavioral Science, University of Colorado, ., p. IV.

owners in a community can be negated by the lack of similar action among other communities in the floodplain.

In addition, floodplain management measures may become less effective if an equal amount of attention is not given for the impacts of increased impervious surface throughout a river basin. Increased impervious surfaces, particularly, in the upper portions of the basin can contribute to higher volumes of water reaching streams within the river basin and at a faster rate during a flood event.

Effective flood hazard mitigation requires consistent floodplain management across multiple jurisdictions in conjunction with a broader basinwide planning approach. The challenges associated with regional land use regulation and intergovernmental coordination—both horizontally and vertically—have been well researched and documented for hazard mitigation as well as other water resources management issues. As a result, many experts including academics and practitioners abandoned the notion of regional planning approaches for application in these urban planning specializations decades ago.

The most effective way to reduce the potential damages and escalating costs of future flood disasters is to integrate flood hazard mitigation actions with watershed planning tools; thus, a regional approach is inevitably needed. With scarce literature and findings about recent basinwide planning approaches, we must then look to successful models of regional planning approaches in other fields such as transportation planning and significant or natural resources protection. As a result, it becomes obvious that all regional planning approaches struggle from obstacles and the factors for success are directly linked to the regional context—especially, the local governments involved and the priorities, motivations and goals that each brings to the table—in which the model was applied.

This masters project seeks to overcome the void in recent research about potential models for regional hazard mitigation by using diverse case studies of regional approaches and considering the local context within a specific river basin. As a result, the paper that follows concludes with a recommended regional institutional approach for the Tar River Basin of North Carolina. The recommended approach is designed to promote strong collaboration between state and local governments, and achieve diverse benefits through the integration of flood hazard mitigation and watershed planning.

I. INTRODUCTION

A. Purpose

The purpose of this masters project is to provide an assessment of a specific problem facing the nation and, particularly, the state of North Carolina—continuous and escalating damages to property and human lives resulting from floods. In addition, the underlying goal of this research is to provide an alternative approach toward this problem and, specifically, shift flood hazard mitigation from coordinated planning processes between local jurisdictions toward a basinwide planning approach. The potential benefits of such an approach include: 1) minimized future flood damages 2) increased access to diverse federal/state programs; and 3) a clear line of authority during local planning and implementation. The rest of this introduction and chapter two, *Alternative Approaches toward Flood Hazard Mitigation*, contains background information that provides the justification as to why a basinwide approach is needed. Chapters three and four describe the details of such a regional planning approach including tools, benefits, and case studies. Chapter five then applies these findings toward a local context. The paper concludes with a recommendation for a regional institutional approach in the Tar River Basin of North Carolina.

B. Research Questions

This paper builds on recent state and local hazard mitigation planning efforts resulting from the Disaster Mitigation Act of 2000 as well as literature on regional and watershed planning approaches. The paper examines and provides answers to the following questions:

- How can flood hazard mitigation be an integral component of land use planning and what is the appropriate geographical scope?
- What is the proper scale of organization necessary to address flood hazard mitigation through land use planning?
- What type of organizational structure would be required? How should policies and programs be created and implemented?

- How would federal and state agencies provide advisory services, technical assistance and grants to support a new institutional approach for hazard mitigation? How would federal/state agencies interact with the new regional organizational structure?

C. Methodology

This masters project concludes with a recommendation for the implementation of an institutional arrangement that includes the ability and capacity to implement authoritative decisions for a geographical area, across numerous political jurisdictions included in a broad geographic area. The final recommendation can be applied to the research fields of hazard mitigation and land use planning at the watershed level.

The methodology used to formulate the recommendation included four parts:

- Literature review;
- Case studies of different regional approaches;
- Face-to-face interviews with hazard mitigation planning staff, city/county managers and local elected officials; and
- Application of recommendation in a study community.

The literature review method was used to obtain information about the problem, existing policies and potential alternatives for effective flood hazard mitigation. A literature review was also conducted for obtaining additional information, where needed, in order to answer the research questions related to potential organizational structures and options for interaction between different jurisdictions and levels of government.

Case studies or examples of regional planning approaches are summarized and analyzed across different urban planning specializations including transportation and natural resources; different components of each model were considered for potential application within the study river basin. Findings or conclusions drawn from the above research methods were then used to explore specific regional institutional options based on the local context of a specific river basin.

The findings from the above research methods were applied to specific information about the local context—the Tar River Basin—to identify a potential solution for a region concerned with

flood vulnerability due to past flood events and positive population growth. The Tar River Basin was selected as the geographic area of study because of a recent data collection effort by the North Carolina's Center for Geographic and Information Analysis and Hazard Mitigation Clinic at the Department of City and Regional Planning. The analysis of this data resulted in an assessment of development management policy distribution with influence on flood hazard vulnerability within the Tar River Basin. The identification of potential regional institutional approaches for flood hazard mitigation was determined to be one of several complementary next steps to the recent data collection and analysis efforts initiated by the State of North Carolina.

The primary source of data for this masters project involved interviews with representatives of local governments within the Tar River Basin to identify challenges and opportunities for implementing a regional approach toward flood hazard mitigation posed by the local context. Persons responsible for developing the DMA2000 All Hazard Mitigation Plan were targeted as interviewees as well as the city/county manager and one local elected official within the same jurisdiction. The interviews were conducted face-to-face and included a set of open-ended questions developed for the multiple rounds of interviews (i.e., staff, manager, and elected official) in each jurisdictions.

The interviews provided those who participated in recent hazard mitigation planning process the opportunity to provide feedback about their experience complying with the federal mandate. The due date for all local hazard mitigation plans was this past November. The experiences and input of those involved in flood hazard mitigation and other planning efforts throughout the state of North Carolina were compiled and used to complete an evaluation of specific models per the realities of the basinwide context. As a result, this research presents an institutional approach that can be supported politically by all levels of government and used as a model of local initiative for replication in other river basins.

D. Problem Definition

The Problem

The amount of property and human losses caused by flooding steadily increased since the Nation first recognized the seriousness of the flood damage problem with legislation and passed the Flood Control Act of 1936 (US Senate Committee on Banking and Currency, p. 4). In 1993, FEMA reported that approximately 10,000 deaths and annual property damage totaling over $1 billion dollars resulted from flooding since 1900 (www.fema.gov). Despite federal, state and local efforts since the implementation of the National Flood Insurance Act of 1967, flood damages during the 1990's alone cost $5.6 billion in property damage annually and today, over eight million families and businesses across the US are exposed to flood risks (FEMA, 2004, p. 1-1).

During 2004, 54 major federal disaster declarations were issued across the United States as of October. Of these federal disaster declarations, flooding was either the major or among one of several contributing factors for 34 declarations. The costs associated with flooding in those states with counties identified as major disaster areas were large. West Virginians received more than $20 million in federal disaster declaration funds on July 16, 2004 in response to the more than 7,600 applications for disaster assistance after a series of storms that began Memorial Day. 34,000 disaster victims suffering from floods in Michigan received approximately $36.5 million in grants and low-interest loans. These dollar amounts hardly compare to the experience of Florida during September 2004 when multiple major hurricanes wreaked havoc on the state. Immediately following the first three hurricanes only, approximately $375 million were approved for disaster victims in Florida including $133 million in housing assistance for residents whose homes were damaged or destroyed by floodwaters and wind (www.fema.gov).

The financial assistance required by communities in declared federal disaster areas describes only part of the problem. These dollar amounts do not include the long-term costs inflicted on

communities such as economic losses incurred in the region or the psychological stress that interrupts the daily lives of those impacted. Nor do the financial impacts compare to the public safety impacts. Three days after the last of the hurricanes to strike Florida, the estimated number of deaths in the state reached 19 with an additional 30 deaths caused by the storm in other southeastern states (www.cnn.com). The Federal Emergency Management Agency (FEMA) cautions people to think about inland flooding when a hurricane strikes and suggests that in the past 30 years more hurricane related deaths resulted from inland flooding as compared to storm surge (www.fema.gov).

Present and Future Implications

It is expected that average annual flood-related damages will continue to rise nationally, because of repetitive flood losses and growth pressures that force communities to expand development in hazardous areas (FEMA, 2004, p. 1-1). The State of North Carolina, in particular, is concerned with current and future flood risks due to historical flood events including Hurricane Fran in 1996 and Floyd in 1999 in which total combined damages exceeded $9.2 billion and resulted in 38 flood related deaths (NC Division of Emergency Management, p. 8-9).

These flood events largely impacted state government in North Carolina regarding disaster management. Immediately after Hurricane Fran, the State implemented the Hazard Mitigation Planning Initiative (HMPI), which still today addresses statewide vulnerability to hazards through local hazard mitigation planning and resultant recommendations to reduce vulnerability. The State's Division of Emergency Management suggests that when Hurricane Floyd hit three years later, the state was well underway in its efforts to institutionalize a "mitigation ethic" in its communities (p. 11). Second, the prevalence of inland flooding during hurricanes and times of heavy precipitation, led the State to investigate the accuracy of FEMA created Flood Insurance Rate Maps (FIRMs) and, specifically, the delineation of floodplains. Finally, the state began to think about future growth projections and appropriate locations for new growth (p. 11).

As a result, North Carolina became a leader in hazard mitigation comparative to efforts nationwide. North Carolina was among the first of the states to implement legislation in 1981 regulating development in hazardous areas along the coast (p. 11). More recently, North Carolina requested the re-mapping of its floodplains before FEMA acquired appropriations for its Map Modernization Project. While the impact of all of the State's efforts thus far is unknown, one result is the attention North Carolina focuses on future development conditions and its implications for future flood risks. In its *Draft State Hazard Mitigation Plan,* the Division of Emergency Management correlates eight of the fastest growing counties (a total of thirteen counties with a growth rate of over 30 percent) as being among those counties included in the presidential disaster declarations after Hurricane Floyd (p. 11).

Possible Causes

In 1982, 5.4 percent of our Nation's watersheds had 15 percent or more of their area developed to urban land cover. By 1997, 9.5 percent of the watersheds in the U.S had 15 percent or more of their areas developed to urban land cover (NRCS, 2001). The 1990's, in particular, was a time of accelerated land consumption as a result of new development; between 1992 and 1997, the national rate of development more than doubled when nearly 16 million acres of land was developed. If current population and growth trends in our Nation continue, it is estimated that 68 million additional acres of rural land will be developed by 2025 (Natural Resources Inventory, 2001).

These statistics illustrate the extent of pervious surfaces lost through the conversion of open space, forestlands and other natural land covers to urban land uses. For example, a parking lot may be 95 percent impervious, a residential lawn may be 40 percent impervious and natural land covers are nearly 0 percent impervious (Anacostia Restoration Team, 1991). This increase in impervious surface directly impacts the land's ability to reduce the rate of run-off and recharge groundwater supplies. High stormwater flows and the increased frequency of flooding are associated with

reductions in groundwater infiltration and altered stream conditions resulting from an overall loss of pervious surfaces in a watershed.

The conversion of rural land to urban land along with low density, sprawling development produced increased vehicle use, roads, construction site sediment runoff, and waste resulting in or exacerbating negative environmental impacts. In addition, specific beneficial functions of natural systems were lost when undeveloped land is converted to urbanized land. It is estimated that over the course of the last 200 years, the US lost 46 percent of the 215 million acres of wetlands that existed upon the arrival of European settlers (Interagency Workgroup on Wetland Restoration, p. 4). The current director of the Environmental Protection Agency's Wetlands Division, John Meagher states "the loss of most wetlands in the upper Midwest, more than 85% in some states, contributed to high floodwaters during the Great Flood of 1993 on the Upper Mississippi River," (p. 2-3). Meagher adds that wetlands provide other natural beneficial functions in addition to flood mitigation and groundwater recharge such as providing critical habitat for fish and wildlife and natural filters by removing sediment, nutrients, etc.

In combination with our changing watersheds and traditional patterns of development, federal hazard mitigation programs and regulations result in minimal positive impact. One of the most effective of all mitigation actions for avoidance of future flood damage, the acquisition of properties and relocation of structures outside the floodplain, is often resisted by local government and property owners due to its high costs, individual notions about property rights and social connections with a place. Elevating structures above the base flood elevation (BFE) or structural controls which are among the remedial mitigation actions recommended by FEMA are also deemed

as too costly despite FEMA programs providing project and planning grants to implement mitigation actions. [3]

A land use planning approach was the original intention behind the original National Flood Insurance Program (NFIP) implemented as a result of the National Flood Insurance Act of 1967. "The twin objectives of the national flood insurance program are (1) to help victims of flood damage restore their homes, businesses, and other property; and (2) to minimize the future risk of flood losses in locations and situations where the risk of loss exceeds the prospect of gain from use of the site…this requires farsighted land use planning and control," (US Senate Committee on Banking and Currency, p. 6). The Act continues with descriptions of the land use and development management tools, including zoning and subdivision controls that may be used to "achieve a sensible use of flood-prone lands." In reality, the NFIP does not promote land use planning and consideration of future conditions, nor does it discourage development in the floodplains. In fact, many would argue that the NFIP and its provision of flood insurance to property owners induces development in flood prone areas and limits opportunities for planning at the local level.

The specific weaknesses of the NFIP are frequently the topic of discussion among floodplain management and hazard mitigation professionals. Critics suggest that the NFIP contains minimum requirements only and that, without close monitoring, required restrictions on new development in the floodplain are often not implemented at the community-level. Second, the data used to formulate new development regulations has proved to be either outdated, such is the case with the Flood Insurance Rate Maps (FIRMs), or too narrow in scope as is local level data, to assess the full scale of the problem and identify effective development regulations. Third, the NFIP was developed with minimal involvement of the states, which proved to be a major omission since local

[3] FEMA grant programs include: the Hazard Mitigation Grant Program (HMGP), Flood Mitigation Assistance Program (FMA), and the newly created Pre-Disaster Mitigation Program (PDM) which is a competitive grant program that provides money to states for local mitigation planning and projects without waiting for a disaster to first occur.

land use authority is enabled and some development management programs mandated by state government.

By requiring a standardized set of actions across communities, the NFIP severely limits opportunities for local land use planning and multi-objective management. The program treats every community the same disregarding specific conditions, flood characteristics (i.e., flash floods, combined erosion and flooding, mud flows, etc.), land uses and planning goals (Riley, p. 259). The mitigation actions recommended by the NFIP allow property owners to receive disaster assistance if implemented; therefore, enabling development in the floodplain as long as mitigation (i.e., primarily elevation) is applied. Furthermore, these mitigation actions are difficult to enforce and frequently, are modified over time in disastrous ways. For example, elevated structures are frequently filled in over time with structural augmentations and personal property. The NFIP's criteria for defining the floodway lacks consideration of the area adjacent to the 100 year floodplain and, therefore, encourages development in or near flood hazard areas that contribute to worsening flood events (p. 258). Most significantly, the minimum requirements of the NFIP do not account for future conditions in a watershed.

In the delineation of the 100-year floodplain, a floodway surcharge value of 1.0' is used to determine the width of the flood fringe and base flood elevation (BFE). Through an encroachment analysis, the floodplains are delineated and flood insurance rates are established. Local governments use these floodplain maps or FIRMs to determine the extent of allowable development in the flood fringe and create related land development regulations. Finally, developers, real estate interests and insurance agents use FIRMs to determine flood insurance rates and potential property losses in the event of a flood (Mecklenburg County SWS Division, 1999).

However, upstream development encroaches on flood storage and conveyance areas and modifies the surcharge level and BFE downstream. As a result, land use decisions are based on local

data or outdated and inaccurate floodplain maps. In response to this flaw in the floodplain mapping process, Mecklenburg County in North Carolina has implemented a broader approach by developing a more restrictive surcharge value of 0.1 in its Floodplain Landuse Mapping Process (FLUM) and using these maps to locate new development.

A floodplain mapping study completed by Mecklenburg County Storm Water Services suggested that the 0.1' surcharge value increased the width of the floodway by over 50 percent along one creek, which results in negligible increases in flood elevations when filling in the flood fringe occurs. In comparison, filling in the fringe could result in increased surface water elevations of approximately 2.5' if land use and development regulations are continuously based on the FEMA's 1.0' surcharge value (Mecklenburg County SWS Division, 1999). Another study contracted by the County estimated that the floodplain remapping project including full build-out conditions and resulting regulations for restricting development/redevelopment in flood prone areas could save the County $300 million in potential flood damages (Dewberry & Davis, 2004).

Persons Affected by Flooding Today and in the Future

The community hit with a storm event suffers from potential property damages as well disturbances to the local economy, job loss, personal injuries, psychological stresses and loss of lives. State and local government must divert resources to help these communities pick up the pieces, as do non-profit disaster relief organizations and community-based groups. While flood related property losses and NFIP operating/ administrative costs are paid through the premiums of policyholders collected and deposited into the National Flood Insurance Fund, these premiums are subsidized by the public and the total costs associated with disaster declarations are in large part taxpayer dollars (Interagency Floodplain Management Review Committee, p. 26). Continuous and increasing future flood damages in the US are, therefore, a national problem.

Meanwhile, FEMA suggests, "all mitigation is local." To a degree, this statement fails to recognize the total impact of the NFIP, the extent of development occurring in flood hazard areas, and the regional impacts of local land use decisions. Furthermore, local governments that attempt to reduce the risks of natural hazards through land use planning and development management are constrained by several factors (Burby, p. 14-18; May and Deyle, p. 61-62). Most frequently cited is the overall lack of political commitment and existing capacity in local government to address activities other than crises or community priorities.

In terms of hazard mitigation, the disaster usually must first occur to elevate the issue on the governmental agenda. Related to this problem, local governments immediate task once a disaster occurs is to "return life to normal" as fast as possible; consequently, mitigation actions or alternative land use strategies are not the focus of local government or community members at this time neither and the result is rebuilding in hazardous areas. The overall lack of will among local government is also blamed on the fact that there is little incentive to do much more than the minimum requirements of the NFIP when communities know they can build where desirable and also be compensated for damages by the federal government in the event of flooding. Finally, denial among local elected official and the public results in the neglect of proactive decision-making related to future flood disasters.

In communities with a pre- or post-disaster focus on land use policies and controls to minimize future flood damages, the effort is thought to be limited by the existing pattern of development within the community. For example, a community with large areas of urbanized land will be less able to apply alternative land use measures. Similarly, in communities with large land areas vulnerable to hazards, it is difficult to use land use tools to steer development to safer land areas (May and Deyle, p. 62). However, there is great potential to utilize existing vacant or

undeveloped land, brownfields, greyfields and densities in urban areas when implementing hazard mitigation actions with additional benefits of redeveloping urban areas.

Perhaps most important in the discussion of local obstacles related to flood damage reduction, is the failure of communities to act regionally regarding hazard mitigation and land use planning. Watersheds have long been recognized as the optimum management unit related to floods and overall water resource management; water flows across political jurisdictional boundaries, as do the impacts of land use activities and development on water resources. As highlighted by the weaknesses of the NFIP, effective flood damage reduction would best be achieved through land use planning and controls implemented at the watershed level (Interagency Floodplain Management Review Committee, p. 93).

Multi-jurisdictional coordination and collaboration proves very difficult to achieve and leads to symbolic results as opposed to real change across political boundaries. Burby further suggests that coordination and collaborative efforts are extremely difficult processes when agreements between jurisdictions related to land use and development decisions are required (p. 17-18). However, flood damage reduction goals can serve as the driving force behind regional planning processes that depend on strong intergovernmental cooperation; a leading example is North Carolina's Coastal Area Management Act of 1974, which put in place a comprehensive regional resource management program for the state's twenty coastal counties.

II. ALTERNATIVE APPROACHES TOWARD FLOOD HAZARD MITIGATION

Local land use planning and development management tools are addressed in further detail in the identification of alternative approaches toward hazard mitigation that follows. However, a fundamental change in "business as usual" will be necessary at all levels of government with the alternative approaches considered since single jurisdiction land use decisions alone will not mitigate

future flood damages. For instance, states may need to take a greater role in designating floodplains as areas of no development and ensure consistency across local governments. Local jurisdictions will need to coordinate and collaborate during future land use decision-making processes; otherwise, future development in the watershed may render other hazard mitigation efforts meaningless. The information presented in the following sections identifies the main objectives and evaluation criteria to be considered during reviews of potential solutions to the problem previously described. This research continues to rely on a literature review to summarize proposed alternatives as well as variations and related implementation information for each. All of the alternatives are critically evaluated in order to identify a preferred alternative for in-depth analysis and implementation strategies.

A. Main Objectives

The topic of flood damage reduction has been the subject of many task forces, conferences and publications. As a result, there have been significant lessons learned, especially post-disasters, and a number of related recommendations to enhance flood damage reduction regulations and programs. Most of these recommendations highlight the fact that crisis-driven decision-making processes and compartmentalized management of the problem not only fail to solve the problem of escalating flood damages but also worsen the problem. Similarly, most experts agree that structural controls and disaster relief assistance also exacerbate the problem. Any solution to the problem of flood damages, particularly as the costs of damages are expected to increase with future population growth and urban development, must be integrated, collaborative, far-sighted and implemented before a disaster occurs.

A national interest in hazard mitigation began in the 1970's and markedly with the implementation of the 1974 Disaster Relief Act. (Platt, 1998, p. 48). The rationale behind this interest was the recognition that natural hazards are not preventable or even controllable but actions

can be taken "to reduce or eliminate the long-term risk to human life and property from hazards," (Schwab, et al., p. 15). Over the decades and through crisis-driven analyses, the most effective mitigation strategy was identified: keep people and structures out of hazard areas. Unfortunately, preventing development in hazard areas, such as coasts and floodplains, often translates to growth restrictions for local government and limits on "highest and best use" among property owners. Hazard mitigation is perceived as conflicting with local land use and development. Therefore, any solution to the problem of flood damages must consider future development and local land use.

A collaborative report by the American Planning Association (APA) and FEMA highlights the fact that the highest rate of growth is occurring in hazard-prone areas because of real estate market appraisals as well as the fact that municipalities and county governments are running out of developable land outside of hazardous areas. The report's findings suggest that growth rates in the triple digits and over the span of a few decades pose significant risks to people and huge costs to government at all levels if a disaster event were to occur. Specifically, the highest growth between 1960 and 1990 occurred mostly in metropolitan areas that are subject to coastal storm hazards; rapid growth occurred in counties that were once sparsely populated and, thus, may not have the resources to plan for disasters before an event happens; and, the top 25 largest population growth rates in counties along the Atlantic and Gulf coasts resulted primarily in southern states and not in New England states where disasters are less frequent and smaller in magnitude (Schwab, et al., p. 13-14). Particularly due to the last point, hazard mitigation is not only a local issue. Growth management, as a tool for reducing flood damages and its costs, requires national attention.

The lack of growth management has made effective floodplain management difficult. More significantly, floodplain management efforts in one community can be made ineffective by upstream development and increases in impervious surfaces throughout the watershed. Thus, local hazard mitigation efforts must expand in geographical scope to include regional or watershed level

mitigation strategies or actions. The main objectives of future hazard mitigation identified in this section begin to resemble the concept of a sustainable community: where people and property are kept out of the way of natural hazards, where the inherent mitigating qualities of natural environmental systems are maintained and where development is designed to be resilient in the face of natural forces (Godschalk, et al., 1998, p. 86). Furthermore, James Witt highlighted the economic costs to the American taxpayer and the social costs to our communities following the 1993 Midwest floods. "The time has come to face the fact that this Nation can no longer afford the high costs of natural disasters," (Interagency Floodplain Management Review Committee, p. viii).

One additional similarity behind the concept of sustainability and hazard mitigation is that both rely on a strong commitment at the community level and partnerships with entities horizontally and vertically aligned. For this reason, an alternative approach to "business as usual" must emphasize benefits and incentives for local governments and community members, such as cost savings in providing municipal services, compliance with federal regulations and promotion of safe, accessible and aesthetically pleasing places to live, work and play.

B. Evaluation Criteria

The preferred alternative, or the alternative with the greatest potential for solving the problem as defined, must include watershed approaches toward local land use planning and growth management in order to effectively mitigate future hazards. A fundamental requirement in the preferred alternative is regional collaboration during planning and implementation processes; the ultimate goal is the development of sustainable communities. The following criteria describe the specific requirements used to evaluate a range of alternatives and select the preferred alternative.

Geographical scope: As stated above, the preferred alternative must be applicable at the watershed level. More specific information about the appropriate scale of watershed management unit (i.e., hydrologic units) will be discussed later; however, during this first pass evaluation of flood

mitigation alternatives, a watershed level approach ensures that all primary threats to human and ecosystem health are identified, the appropriate stakeholders can be involved, and corrective efforts are taken in a holistic and integrated manner (National Research Council, p. 15).

Intergovernmental collaboration: History illustrated that hazard mitigation involves all levels of government. However, command-and-control mandates and disaster relief resulted in significant and negative unintended consequences largely due to flaws in execution by all levels of government. Due to the importance of local context and mitigation, the preferred alternative must begin with bottom-up approaches but include equal levels of commitment from at all levels of government. Since the application of watershed-level actions is required to mitigate future flood damages, horizontal collaboration between local governments and, in some instances, state governments must also be considered.

Cost-effective: The costs of flood damages are expected to increase in the future; meanwhile, federal requirements may add to these costs for state and local governments without producing substantial reductions in flood damages or lower costs for relief, reconstruction and recovery programs. As our natural resources become scarce and protection of water resources (i.e., quantity, quality, habitat, etc.) becomes more costly for local governments, experts have long espoused the cost-effectiveness of an integrated water resources management approach that achieves multiple-objectives. Finally, this criterion assumes that funding for proposed alternatives is currently or would be made readily available. This criterion could be considered as the "hook" that builds support for changing "business as usual" practices among government and individuals.

Stakeholder involvement: Floodplain management has long been recognized as an essential component of effective hazard mitigation; yet, floodplain management remains controversial. Conflicting governmental policies that subsidize development in floodplains and the short-term economic gains provided by the market for locating development in floodplains can

negate floodplain management efforts. Thus, all taxpayers have a stake in flood hazard mitigation but the involvement of individuals representing specific interests (i.e., property owners, home builders, real estate professional and commercial developers, etc.) during the development and implementation of mitigation actions would help to counteract several challenges associated with flood hazard mitigation. The benefits of stakeholder involvement include a community that is well informed about the risks associated with hazard areas and input in the development of alternatives to ensure widespread support during implementation.

Legally feasible: The preferred alternative must conform to all federal, state and local administrative and procedural law or, otherwise, some existing means of amending or extending legal provisions to allow for the implementation of the alternative must be identified. In particular, legal problems associated with land use decisions and private property rights (i.e., "takings) must be avoided (Olshansky and Kartez, p. 185-186).

Politically acceptable: This criterion considers the ways in which policy decisions are currently made (i.e., crisis-driven, incremental, fragmented, etc.) and motivation behind decision-making processes (i.e., growth pressures, constituent demands, electoral votes, etc.). The overall success of the preferred alternative depends on the level of commitment of citizens and elected officials as well as incentives made available or recognizable during the decision-making process.

Land use and development authority: Too often plans "collect dust on shelves" regardless of the quality of the plan and/or planning process. Similarly, our legislative processes are piecemeal and the original objectives of the program or project can be lost during actual implementation and unintended consequences may result. Those involved in the planning process must assume a sense of ownership over the final plan or action to be taken to ensure that the desired outcomes of the planning process are actually achieved. Therefore, those involved in developing

mitigation plans or actions must also be enabled with the authority to implement, oversee and modify land use and development decisions throughout the watershed.

C. Evaluation of Proposed Alternatives

A number of proposed alternatives recommended by experts in the field of hazard mitigation were selected for evaluation to identify the alternative(s) that would best achieve the research objective—the development of a watershed approach toward local land use planning and growth management to mitigate future flood hazards. The evaluation of all proposed alternatives is included in Appendix B and organized according to the source of the recommendation—interagency task forces, academic researchers or the Association of State Floodplain Managers. Each recommendation was considered based on the evaluation criteria described previously. In Appendix B, the information in parentheses following each recommendation indicates the entity(ies) for which the recommendation is targeted at; in other words, these entities would assume lead responsibility in the implementation of the recommendation. The matrices in Appendix B also include evaluation results; a "yes," "no," or "possibly" was marked to indicate whether or not the recommendation met specific criteria. Therefore, a point was theoretically assigned for each evaluation criteria met and "possibly" was scored higher than "no." The results of the evaluation are summarized in the following section. Those recommendations that did not meet or possibly meet both the geographical scope or land use and development authority criteria are given minimal attention and were not considered as a preferred alternative.

Interagency Floodplain Management Review Committee

The information presented in this report, thus far, is not new information nor are the proposed alternatives below. The problem of flooding and related costs of damages has repeatedly been the subject of national attention. In recent year, several interagency task forces were convened to address the issue. Most notably, the Interagency Floodplain Management Review Committee was

formed immediately following the Midwest Floods of 1993 by the White House to establish a multi-disciplinary team that would undertake an intensive review to determine the major causes and consequences of the floods. As a result, the Review Committee identified the need for a national Floodplain Management Program and the revitalization of the Water Resources Council in their report, *Sharing the Challenges Floodplain Management into the 21st Century,* also known as the "Galloway Report." As of yet, these two overarching recommendations were not implemented possibly due to higher federal priorities or lack of support within the Executive Office.

The Review Committee covered a range of flood-related topics with their recommendations including organization of intergovernmental responsibilities and activities, coordination of project development and programs, comprehensive evaluation across multiple federal agencies, the NFIP, constructed water resources projects, critical water resources management information, and management of the upper Mississippi River. However, the Review Committees largely focused on the programs and activities at the federal government level; as a result, many of the recommendations failed to meet the geographical scope, land use and development authority and stakeholder involvement criteria.

The Review Committee recommendations that performed well in the evaluation emphasized existing local hazard mitigation or land use practices such as funding, through existing authorities, programmatic acquisition of needed lands from willing sellers; seeking legislative authority to increase post-disaster flexibility in the execution of the land acquisition programs; encouraging states and communities to develop and implement floodplain management and hazard mitigation plans through the NFIP's CRS; and, providing funding for programmatic buyouts of structures at risk in the floodplain. However, it is unclear if these recommendations were intended for implementation at a regional scale, which would prove more effective if land was targeted for acquisition based upon consideration of watershed characteristics.

A number of the specific recommendations focused on the upper Mississippi River Basin because of the extensive damages resulting from the 1993 Midwest floods, the impetus behind the Review Committee. The recommendations for the upper Mississippi River were intended to provide integrated, hydrologic, hydraulic and ecosystems management for the upper portion of the River. Although large scale federal programs and expenditures are typically difficult to justify, the 1993 events created a crisis situation in which the public demanded governmental action and, at the time of the Review Committee, political support was potentially very high. However, federally created river basin commissions, as called for with this recommendation, existed during 1965-1981 and were disbanded because of a lack of authority and the contentious issues facing the commission (National Research Council, p. 213). The level of stakeholder involvement and local land use/development authority is unclear but assumed to be insignificant since these recommendations largely seek to improve coordination between federal governmental agencies or charge federal agencies with implementing new projects. The lack of these two criteria could result in another failed federal attempt to manage water resources at the watershed scale.

Academic Researchers within the Hazard Mitigation Field

Several of the recommendations offered by the academic perspective were similar to those of the Review Committee including establishing an interagency task force to develop a coordination strategy to guide the actions of the federal agencies, appropriating Congressional funds to acquire land in hazardous areas for public use/non-use, and implementing surcharges to premiums charged for repetitive loss properties. However, the recommendations related to land use planning and developing sustainable communities faired best in the evaluation of academic researchers' recommendations. Each of the following recommendations were evaluated highly but could be improved if applied at the watershed scale and may be difficult to implement where political support is lacking.

- Mandate planning so that the community utilizes unique local circumstances before development pressures mount and to take advantage of federal incentive programs such as CRS.
- Tie federal and state aid for infrastructure to community participation in land use planning processes since natural hazards, if ignored, has the potential to wreck these investments.
- Target recalcitrant local governments for particularly close attention in monitoring their compliance with the requirements of a variety of other federal and state assistance programs.
- Encourage all levels of government to define for themselves the meaning of sustainability and the ways in which it can be accomplished.

Burby, et al., expands on the above alternatives by suggesting that land use planning could be the coordinating mechanism in which federal agencies are required to act in ways that are consistent with state and local plans. The goal is to minimize overall policy fragmentation (similar to the Coastal Zone Management Act) and foster systematic, collaborative planning processes at the state and local level rather than promulgate vast new public investment programs to control natural hazards or attempt direct regulation of hazardous areas. These recommendations illustrate two fundamental but innovative concepts discussed in academia: one, developing a plan serves multiple, beneficial purposes in a community and, two, hazard mitigation must begin with a "bottom-up" local view of the intergovernmental system (Godschalk, et al., 1998, p. 85).

Academic researchers call for the development of a coordinated strategy at state and local levels, where property is actually exposed to hazards and the impacts of natural disasters are experienced most severely. These recommendations could potentially achieve the overall objective previously identified in that they address land use planning, growth management and intergovernmental coordination. However, the recommendations as presented only imply that the most significant criteria could be met. The geographical scope of application must be at the watershed level and the planning processes must involve a diverse set of stakeholders. Most importantly, those deeply involved in coordinated strategies or planning processes must be provided the land use and development authority necessary to implement plan results. Implementation is the

point at which even the most successful coordination, planning and consensus building efforts can break down and the regional approach required to achieve the overall objective makes implementation of land use decisions even more difficult.

Association of State Floodplain Managers

The Association of State Floodplain Managers (ASFPM) is an organization of professionals representing local, state and federal government agencies, citizen groups, private consulting firms, academia, the insurance industry, and lenders involved in floodplain management and flood hazard mitigation, preparedness, warning and recovery. The work of the organization, founded in 1977, influences policy and practice changes that impact floodplain management in the U.S. and internationally. ASFPM's stated mission is "to mitigate the losses, costs and human suffering caused by flooding and to promote wise use of the natural and beneficial functions of floodplains," (www.floods.org).

ASFPM is in the process of developing the No Adverse Impact (NAI) approach for floodplain management to ensure "the action of any community or property owner, public or private, does not adversely impact property and rights of others." ASFPM, through its NAI approach, developed a floodplain management framework for communities, which is intended to assist communities in meeting a diverse set of needs, not just minimum requirements identified by federal and state government. In addition, the NAI approach corresponds with NFIP's CRS to assist local governments implement CRS activities and gain CRS points for insurance premium reductions. NAI is designed to be a proactive and inclusive approach toward reducing and preventing flood problems; as a result, NAI extends floodplain management beyond the floodplain and includes development management in the watersheds where floodwaters originate. (ASFPM, p. 8).

The ASFPM recommendations included in this evaluation were taken from their publication, No Adverse Impact: a Toolkit for Common Sense Floodplain Management. Specifically, ASFPM

organized its "tools" under seven "building blocks" including distinct categories for planning and regulations/development standards. The tools listed for these two categories were evaluated as best among the ASFPM recommendations. The recommendations that seek to enhance local planning are comprehensive, forward-thinking, and participatory and target the root causes of the flood problem. However, actual effectiveness is dependent on the geographical scope of application and land use and development authority provided to local governments within the watershed. These recommendations include:

- Identify all the impacts of the hazard and all of the alternative measures to address the impacts; include consideration of "what happens" and "who really pays" to be aware of all the ramifications in planning and decision-making processes.
- Promote multi-objective management in which public involvement and coordination of floodplain management with other community concerns, such as economic development, housing, water quality, habitat protection and recreation.
- Use the principles of sustainable development to guide community planning efforts related to floodplain and coastal zone management.

Several other ASFPM recommendations seek to enhance watershed protection through regulations; these recommendations include innovative approaches that are widely becoming more accepted as land use and development management tools such as transfer of development rights, setbacks and buffers, wetland creation and protections, stormwater BMPs, and stream restoration techniques. As these tools are more commonly used to achieve multiple objectives, the actual design and benefits will become more recognizable to local agency staff, elected officials, diverse stakeholders and the broader public. The benefits for flood mitigation, in particular, would be maximized if these tools were located strategically based on watershed characteristics as well as principles of sustainable development and Smart Growth.

The ASFPM recommendation of conducting master flood protection planning and monitoring assumes a watershed approach and possible land use and development authority. The rationale is similar to that of the recommendation for creating an interagency task force or

revitalizing the Water Resources Council: water resource decisions and projects, including stormwater management, floodplain management, hazard mitigation and watershed planning, are interrelated. If impacts related to water resources cross over jurisdictional boundaries then so should actions identified to address these impacts and an integrated services approach is cost-effective. However, there is potential for failed implementation of master flood protection plans and monitoring strategies if adequate regional land use and development authority does not accompany the recommendation, particularly since large-scale and integrated planning processes are often unsupported.

III. CONVEYING THE BENEFITS OF A WATERSHED APPROACH

The EPA Office of Water provides extensive information about watersheds including basic fact sheets and trainings for a watershed approach framework. As part of these resources, the EPA describes the benefits of a watershed approach framework and, specifically, suggests that utilizing a watershed basis for operating and coordinating programs "makes good sense for environmental, financial, social, and administrative reasons." The description of a watershed approach below is particularly significant for local government (http://www.epa.gov/owow/watershed/framework.html):

> "Besides driving results towards environmental benefits, the approach can result in cost savings by leveraging and building upon the financial resources and the willingness of the people with interests in the watershed to take action. Through improved communication and coordination the watershed approach can reduce costly duplication of efforts and conflicting actions. Regarding actions that require permits, specific actions taken within a watershed context (for example the establishment of pollutant trading schemes or wetlands mitigation banks and related streamlined permit review) enhances predictability that future actions will be permitted and reduces costs for the private sector. As a result, the watershed approach can help enhance local and regional economic viability in ways that are environmentally sound and consistent with watershed objectives."

The EPA Watershed Approach is frequently referenced as a federal level effort to implement watershed level planning or management. However, the agency's approach is very much process oriented and often criticized for being primarily focused on water quality improvements. Although the agency does seem to be moving toward a more multi-objective focus with its mandates and activities, its watershed approach is founded on the following guiding principles (http://www.epa.gov/owow/watershed/ framework.html):

- Those people most affected by management decisions are involved throughout and shape key decisions;
- Activities are directed within specific geographic areas, typically the areas that drain to surface water bodies or that recharge or overlay ground waters or a combination of both; and
- Collectively, watershed stakeholders employ sound scientific data, tools, and techniques in an iterative decision making process.

In contrast, the Center for Watershed Protection (CWP) provides watershed protection tools and techniques for direct application by resource managers throughout a watershed. Many of the tools and techniques recommended by CWP have been or are being implemented by local governments, community groups and property owners everyday for a variety of reasons. In *Rapid Watershed Planning Handbook*, CWP identifies the following watershed protection tools and techniques include:

- Watershed planning
- Land conservation
- Aquatic buffers
- Better site design
- Erosion and sediment control
- Stormwater management
- Management of non-stormwater discharges
- Watershed stewardship

Descriptions of CWP's watershed protection tools and techniques illustrate not only the diversity of objectives—water quality improvements, current and future water supply protection

(including groundwater recharge), stream protection/restoration, habitat protection/restoration and human consumption enhancements (including recreation, tourism, outdoor education, biodiversity study, and commercial fishing)— achieved through implementation of one or more of the tools and techniques but also flood hazard mitigation as a workable objective .

While CWP notes that its watershed protection approach is best applied at the watershed or subwatershed management unit, in other words the 6, 8 or 14 digit hydrologic units, the purpose of the information in this section is simply to describe the different tool/technique categories, related actions, and benefits to flood hazard mitigation as well as other or multiple objectives. The summary of benefits presented later will discuss broader, long-term benefits for individual jurisdictions as well as the aggregate benefits for larger sub-basins and basins if such a comprehensive and multi-objective planning approach were to be employed consistently across subwatersheds and watersheds.

A. Watershed Planning

According to the CWP, watershed planning is the most important of all watershed protection tools due to development in a watershed that leads to increased impervious surfaces throughout the watershed. The amount of impervious surface in a watershed directly correlates with stream quality, an indicator of overall watershed health. CWP recommends the development of a watershed land use plan to effectively protect the watershed by identifying the degree and location of future development that minimizes the negative impact to stream quality. Several of the steps for developing a watershed land use plan involve widely accepted or feasible land use planning tools including modeling impacts to water supplies with future land use changes or developing a future land use pattern to meet water resources goals. The establishment of an on-going management structure to adopt and implement the watershed land use plan is perceived as one of the more difficult or challenging tasks of watershed planning.

Furthermore, the recommended watershed planning tasks suggests that the subwatershed scale (i.e., 1 to 10 square miles) is most appropriate for developing a watershed land use plan. However, CWP also suggests that one of the primary goals of land use planning is "to shift development toward subwatersheds that can support a particular type of land use and/or density." This goal implicitly suggests that a coordinated approach is needed to decide where development and development should be allowed in a larger region or watershed level.

CWP identify a variety of watershed planning techniques to manage land use and minimize impervious surfaces in a subwatershed, including:

- Watershed based zoning
- Overlay zoning
- Floating zones
- Incentive zones
- Performance zoning
- Urban growth boundaries
- Large lot zoning
- Infill community redevelopment
- Transfer of development rights

Many of the techniques above are cited as tools for achieving land use planning objectives in diverse fields including economic development, growth management, and natural resources management. Due to the scope of techniques and scale of the watershed planning process, the techniques above are also capable of achieving the full spectrum of water resources management objectives—water quality improvements, current and future water supply protection, stream protection/restoration, habitat protection/restoration and human consumption enhancements. Specific to flood hazard mitigation, applying land use planning techniques helps to redirect development, preserve sensitive areas such as floodplains and related natural and beneficial functions, and maintain or reduce the impervious cover within a given watershed, which is the most significant action for managing stormwater.

The remainder of the CWP watershed protection tools described, is similar to watershed planning in that all seek specific primary objectives but could be part of a comprehensive tool kit to achieve the multitude of water resource related objectives including flood hazard mitigation. As a result, the watershed protection tools below could be part of any approach seeking to achieve the broader goals of long term cost savings, water resources planning, CRS, NAI, smart growth and sustainable development. The remaining tools are defined with potential primary and secondary objectives identified to promote implementation.

B. Land Conservation

CWP suggests that specific land types in a watershed need to be conserved because of the natural resources and/or cultural areas often contained. These land types include: critical habitats, aquatic corridors, hydrologic reserve areas, water hazards and cultural areas. Land conservation is a tool to ensure that the integrity of aquatic and terrestrial ecosystems is sustained and the desired human uses associated with water resources maintained. This goal of land conservation is directly concerned with the water resource management objectives from above and the range of land types covers most all critical environmental areas including floodplains, stream channels, spawning areas, riparian areas as well as forests, crops and pasture which serve as desirable hydrologic reserves.

Depending on the extent of protection desired, there exists a spectrum of land conservation techniques, including:

- Land acquisition;
- Conservation easements;
- Regulation of land alteration;
- Exclusion of water pollution hazards;
- Protection with open space designs;
- Landowner stewardship; and
- Public sector stewardship.

Implementing land conservation tools and techniques at the local level also creates cultural and aesthetic amenities within a community including landscape enhancements, increased property values with proximity to protected areas and open space, and recreational benefits in the form of running and biking trails or picnic and birdwatching areas. When developed and implemented at a watershed level, land conservation tools can lead to expanses of open space, greenways, trails and bike paths that provide a region with alternative transportation networks, contiguous habitat and migratory paths, tourism opportunities and continuous flood storage and conveyance areas.

C. Aquatic Buffers

Buffers are a common topic of debate in communities today because of the land use and development implications associated with this watershed protection tool. CWP suggests that the areas where land and water meet, or the aquatic corridor, deserve such special protection due to the natural and beneficial functions provided by these areas including streams, shoreline, or wetlands. Furthermore, buffers are used to physically protect and separate a stream, lake or wetland form future development and encroachment. The following benefits are attributed to aquatic buffers:

- Regulates light and temperature conditions, improving the habitat for aquatic plants and animals;
- Effective in removing sediment, nutrients, and bacteria from stormwater and groundwater;
- Helps to stabilize and protect the streambank; and
- Acts as a right-of-way during floods and sustains the integrity of stream ecosystems and habitats.

CWP further suggests that buffers are integral parts of the watershed protection strategy due to the role buffers play in protecting receiving water quality, the overall indicator of watershed health. The design of buffers entails three zones and the buffer design is intended to be large enough in width to allow for the protection of special areas including wetlands and the floodplain. At the

local level, buffers can be implemented through a variety of land use planning tools including buffer ordinances and resource protection overlay districts.

D. Better Site Design

Extensive and expansive amounts of impervious surface resulting from traditional development patterns require mitigation of negative impacts at the site level. Improving site design through a variety of techniques can reduce the impact of new development. Specifically, better site design through zoning and subdivision ordinances and design guidelines can reduce the amount of impervious surface and manage stormwater onsite to achieve multiple water resource related objectives. Several categories of better site design can have a significant effect on subwatershed protection, including:

- Residential streets and parking lots;
- Lot development;
- Conservation of natural area; and
- Low impact development.

FEMA highlights the impact of site design in flood hazard areas in a 1997 report produced by the agency and the APA entitled, *Subdivision Design in Flood Hazard Areas.* The report suggests that through subdivision ordinances and site plan review processes at the local level, site design can complement special flood hazard area requirements in zoning ordinances and floodplain management and land use planning processes. The report describes in detail a set of best management practices (BMPs) to prevent an increase in downstream flooding such as impervious surface limits, retention and detention ponds, infiltration devices and swales. These BMPs effectively improve site design and, as a result, achieve multiple objectives, namely, flood hazard mitigation, and stormwater management. In addition, the broader goals of ASFPM's NAI and Smart Growth—specifically, the principle related to fostering distinctive, attractive communities with a

strong sense of place—can be achieved where better site design practices are applied throughout communities.

E. Erosion and Sediment Control

Many states and localities operate erosion and sediment control programs to mitigate the impact of new development particularly during construction processes such as clearing and grading. CWP describes these processes as follows:

> "Perhaps the most destructive stage of the development cycle is the relatively short period when vegetation is cleared and a site is graded to create a buildable landscape. The potential impacts to receiving waters are particularly severe at this stage. Trees and topsoil are removed, soils are exposed to erosion, natural topography and drainage patterns are altered, and sensitive areas are often disturbed."

The primary objective of erosion and sediment control programs and related ordinances is to reduce sediment loss during construction. In addition, multi-objective planning results as erosion and sediment controls also utilize land conservation and buffers to ensure critical environmental areas and related natural and beneficial functions are not cleared or disturbed. CWP suggests several techniques to provide erosion and sediment control— for example, minimize clearing through regulation, sedimentation basins, and silt fences—but also notes that without proper installation and maintenance of the techniques below, erosion and sediment controls are ineffective.

F. Stormwater Management

Stormwater management practices are techniques used to "delay, capture, store, treat or infiltrate stormwater runoff." As a result of National Pollutant Discharge Elimination System (NPDES) Phases I and II, many large and smaller municipalities are implementing extensive stormwater programs, some organized similar to water and sewer utilities, to comply with federal regulations. However, a number of objectives can be achieved through stormwater management programs implemented at the local level:

- Maintain groundwater recharge and quality;
- Reduce stormwater pollutant loads;
- Protect stream channels;
- Prevent increased overbank flooding; and
- Safely convey extreme floods.

The benefits attributed to stormwater management programs can be achieved through several different techniques including structural management practices such as constructing ponds, wetlands, infiltration and filtering systems, and open channels. CWP suggests, however, that stormwater management practices alone cannot achieve water quality goals. Stormwater management is just one tool comprising a comprehensive watershed protection approach; implementing the full toolkit is the most effective way to achieve primary as well as broader objectives. Furthermore, CWP asserts that stormwater management practices designed or located improperly can cause more severe secondary environmental impacts than if they were not installed at all.

G. Management of Non-stormwater Discharges

Non-stormwater discharges are strictly regulated by NPDES, which requires all municipal septic and wastewater systems to obtain a state or federal permit due to these systems' contributions of pollutant loads to receiving waters. Other non-stormwater discharges found within the subwatershed area that should be considered due to the significant pollutant loads include industrial NPDES discharges, urban "return flows" (discharges caused by activities such as car washing and watering lawns), water diversions, and runoff from confined animal feeding lots. Specific management techniques related to non-stormwater discharges include inspecting private septic systems, repairing or replacing failing systems, utilizing more advanced on-site septic controls, identifying and eliminating illicit connections from municipal stormwater systems, and spill prevention.

H. Watershed Stewardship

Often, a distinction is made between pre-development and post-development watershed protection tools. CWP suggests watershed stewardship is an investment that communities must undertake once a subwatershed is developed. While the primary goal of watershed stewardship is to increase awareness and encourage public participation in watershed management efforts, it is also a means to multi-objective ends.

Watershed stewardship is particularly helpful in achieving the objective of flood hazard mitigation since effective flood hazard mitigation, specifically property acquisition and relocation out of the floodplain, directly depends on partnerships between governmental agencies and private property owners. In addition, pre-disaster mitigation planning often lacks public input and involvement. Several studies have shown that the general citizenry are aware of hazards, but have little concern for taking action. Even in areas that have experienced the devastating effects of flooding, consideration of future disaster events fast becomes a low priority in the face of other more pressing concerns, like work, school and family. Because natural hazards are such low-probability events, people tend to give them little regard.

By including flood hazard mitigation as one of several objectives, watershed stewardship programs would help raise awareness and provide information to the community about a variety of water resource management issues. Specifically, watershed stewardship programs involve advocacy, education (i.e., awareness, personal stewardship, professional training, and watershed engagement), pollution prevention, maintenance, indicator monitoring and restoration. In its advocacy for a multi-objective management approach toward proactive hazard mitigation and floodplain management, ASFPM suggests that plans need to address many concerns to build broad support for them and a more sustainable community (2003, p. 34).

I. Summary of the Direct and Indirect Benefits

The watershed protection approach described above requires a diversity of interested stakeholders to develop and implement the appropriate tools. While local government may have the lead responsibility for implementing the most significant of all tools—watershed planning—supporting others who seek to implement other tools would essentially spread responsibility and costs for achieving common goals. For instance, with many land use regulations, education for property owners and community members is critical for full support and subsequent implementation. Watershed stewardship groups can supplement local government's efforts toward watershed planning by providing the education and outreach component. In addition, local governments may work closely with local land trusts or obtain state and federal grant money to implement land conservation techniques that would enhance the effectiveness of watershed planning techniques such as impervious overlay zoning, incentive zoning or urban growth boundaries.

The tools highlighted by CWP are interconnected in that they assist in the implementation of other watershed protection tools designed to achieve similar primary objectives. Table 1 on the following page highlights the commonalities between the different watershed protection tools related to primary objectives. While many of these watershed protection tools are widely used throughout the country, it is often the case that local governments are simultaneously trying to achieve multiple benefits or objectives but with distinct planning processes and subsequent actions. Perhaps more frequently, separate departments or funding mechanisms are responsible for distinct planning and implementation processes. The result can be an inefficient use of local government resources. In other words, a comprehensive approach is more cost-effective than piecemeal planning.

Table 1: Comparison of CWP Watershed Protection Tools and Primary Objectives

	PRIMARY OBJECTIVES					
Watershed Protection Tool Type	**Water Quality Improvement**	**Ground Water Recharge**	**Stream Protection/ Restoration**	**Habitat Protection/ Restoration**	**Human Consumption Enhancement**	**Flood Hazard Mitigation**
Watershed Planning	✓	✓	✓	✓	✓	✓
Land Conservation	✓	✓	✓	✓	✓	✓
Aquatic Buffers	✓		✓	✓		✓
Better Site Design	✓	✓				✓
Erosion & Sediment Control	✓		✓	✓		✓
Stormwater Management	✓	✓	✓			✓
Management of Non-Stormwater Discharges	✓					
Watershed Stewardship	✓	✓	✓	✓	✓	✓

The development of projects that combine different tools to achieve multiple objectives improves access to diverse funding opportunities. Various funding opportunities are available, primarily through state and federal grant programs, for each of the primary objectives identified above. However, extensive grant writing skills are required to successfully tailor the project or

separate out key elements in a way that meets program eligibility requirements, which tend to be very specific based on the mission of the funding agency.

The following grant opportunities are organized for several of the primary objectives associated with the watershed protection approach described above. All grants identified below include a local match requirement as a percentage of the total project cost. The information for the first four grant types below was compiled by Anna Osland, masters candidate at University of North Carolina's Department of City and Regional Planning, during an internship with the Clean Water Management Trust Fund in Raleigh, NC. The last grant category, flood hazard mitigation, was obtained from NC's Division of Emergency Management website. The grant information below illustrates those programs that, as of September 2004, include a grants manager on staff and are currently available in the state of North Carolina. Finally, the information below should not be considered an exhaustive list of all available grants since others may exist.

Watershed planning: Water Resource Development Project Grant; Community Planning Program (NC Dept. Commerce); Emergency Watershed Protection Program (Natural Resources Conservation Service); Ecosystem Enhancement Program (NCDOT and NCDENR); Urban and Community Forestry Grant; Adopt-A-Trail Program; and NC Parks and Recreation Trust Fund.

Land acquisition: Water Resource Development Project Grant; Clean Water State Revolving Fund (CWSRF); Emergency Watershed Protection Program (Natural Resources Conservation Service); Ecosystem Enhancement Program (NCDOT and NCDENR); Wetlands Reserve Program; and NC Parks and Recreation Trust Fund.

Restoration: Clean Water State Revolving Fund (CWSRF); Clean Water Act 319(h) Grants; Emergency Watershed Protection Program (Natural Resources Conservation Service); Ecosystem Enhancement Program (NCDOT and NCDENR); Wetlands Reserve Program; Urban and Community Forestry Grant; Native Plant Conservation Initiative; and Adopt-A-Trail Program.

Water quality improvements: Clean Water State Revolving Fund (CWSRF); Clean Water Act 319(h) Grants; Capacity Building Grants (N.C. Rural Economic Development Center); Unsewered Communities Grants (N.C. Rural Economic Development Center); and Supplemental Grants Program (N.C. Rural Economic Development Center).

Flood hazard mitigation: Water Resources Development Project Grants; Watershed Protection and Flood Prevention Loans (Rural Utilities Service); Watershed Protection and Flood Prevention (NRCS); River Basin Surveys and Investigations (USACE); Flood Control Projects (USACE); Snagging and Clearing for Flood Control (USACE); Resource Conservation and Development (NRCS); Hazard Mitigation Grant Program (FEMA); Flood Mitigation Assistance (FEMA); and Pre-disaster Mitigation Assistance (FEMA).

If broader thinking were employed, it is possible to identify broader, long-term benefits associated with watershed planning and other protection tools. In addition, if the tools were to be employed consistently among adjacent or neighboring jurisdictions, the indirect and direct objectives may be realized for a larger geographical area such as the river basin. These broad benefits are described below specifically in the context of local flood hazard mitigation. The ultimate goal in providing this information is, therefore, to promote a collaborative watershed protection approach across multiple jurisdictions within a river basin. A multi-objective or comprehensive approach at the watershed level may minimize conflicting actions among watershed communities, which is critical for effective flood hazard mitigation, and assist these same communities to achieve broader long-term goals including:

- Overall cost savings;
- No adverse impact (NAI) as described by ASFPM;
- Integrated water resources planning, or ensuring future water quality and supply for local population;
- Regional "smart growth" or growth management; and
- Sustainable development.

Local Government Cost Savings

The objectives and techniques associated with a watershed approach are directly aligned with broader development goals including local cost savings. At the local government level, cost savings from a watershed approach can be realized in several ways: sharing of staff, technical expertise and data across municipalities, infrastructure and service provision decisions, promoting land uses that increase the local tax base, stormwater management through low-cost mitigation measures and lowered future maintenance costs, inclusion of diverse stakeholders in watershed protection activities, and minimizing the costs associated with future flood damages. All of these cost saving or revenue enhancing activities, when considered as part of a watershed approach, can also reduce costs associated with regulatory compliance for diverse water resources today and into the future (since the general perception is that these will become increasingly stringent into the future). While this latter benefit will be discussed in regards to broader water resources management in the following section, examples of cost saving mechanisms related to a watershed protection approach are described below. Although local governments are all organized differently based on size, availability of funding and mandates or authorities provided by the state, the cost savings described below generally apply within departments responsible for public works, engineering studies or projects, short- and long-term planning or community development, and natural resource protection or management.

Most directly, CRS provides NFIP communities additional points for collecting additional flood data at a broader geographical scope, implementing stormwater management and flood protection tools, and implementing floodplain management planning at the watershed level. There are actually 18 activities in which credit points are awarded and a CRS classification is assigned. Different premium discounts are provided for each CRS classification: all communities begin with a CRS rating of 10, which provides no discount; CRS ratings 1-9 receive discounts between 45 and 5

percent, respectively. According to FEMA, the average flood insurance premium costs about $300 a year for an average of $100,000 of coverage; therefore, a community CRS rating of 8 would lower that premium 10 percent to $270.

Collaborative approaches can produce real cost savings for individual participants such as local governments, in terms of sharing staff and local resources for various programs that would help individual jurisdictions meet regulatory requirements and plan for future development. For example, the Cayuga Lake Watershed Intermunicipal Organization formed to "allow local governments within the watershed to work together for the purposes of accessing dollars, cost savings, cost sharing, and efficiency of activities among municipalities," (www.cayugawatershed.org). Specifically, representatives from 32 municipalities in the watershed have agreed to work together and share costs for the following programs and activities: develop a watershed characterization report, establish watershed priorities, endorse funding requests, provide a forum for municipalities to interact and exchange information, review technical reports, and promote public education on watershed issues.

The Tampa Bay Estuary Program stresses regional cooperation through the efficient use of existing resources allocation and even redirecting funding allocations to help local governments achieve broad regional goals. During its early years as a National Estuary Program (NEP), the Program conducted a study indicating that total existing bay-related expenditures across local, state and federal governmental agencies exceeded $250 million (FY 1994-1995). Roughly, $170 million or 68 percent of that amount was devoted to wastewater collection, reuse and retreatment—activities considered to indirectly or directly benefit the bay even if restoration of the bay is not the primary objective (Tampa Bay National Estuary Program, p. 231). As a result, the Program focuses its efforts on improving coordination and planning between local governments and, specifically, the

wastewater utility enterprise funds local agencies operate. (For more information about the Tampa Bay Estuary Program, see case study 1 on page 62.)

A comprehensive approach, such as the watershed protection approach, allows areas fit for development to be identified as well those areas that should be used for low intensity development or remain undeveloped. According to CWP, some subwatersheds or watersheds may be better suited for development based on historical data about impervious cover and response of water resources to land use changes over time. Using this information, real cost savings result from proactive decisions about infrastructure development and service provision in growth areas and in ways that do not negatively impact future water quality or supply.

Traditionally, our Nation's pattern of growth encourages discontinuous, low-density, auto-dependent development in urban and suburban areas; the costs of traditional development are high-environmentally, socially and economically. Connecticut's taxpayer-funded debt is an example of the costs of traditional growth; in 2002, the state's debt reached $11.8 billion as a result of growth-related capital spending for the construction of roads, schools and other state-funded development. This dollar amount is equivalent eight percent of the state's total personal income (Katz and Muro, 2003). Last year, the Brookings Institution published findings of studies suggesting that compact growth reduces development costs by as much as 70 percent for state governments as compared to sprawl or unplanned growth.

At the local level, new residential development demands more in services than it contributes in taxes, and existing residents essentially pay for development. A comparative study of two townships in Central Michigan shows that for every $1 in revenue, residential development costs were $1.20 or $1.47 while farmland and open forest land required only $0.24 or $0.27 (Tetra Tech, Inc., 2004). While residential development will continue to be built according to new demands, designing and constructing in a way that also allows farmland and open space to co-exist would be

beneficial and cost-effective. "Farmland and open space conservation have indirect positive tax benefits such as reducing costs for flood control and water supply, and adds to the aesthetic value and character of a community, often capitalized in land value" (Tetra Tech, Inc., 2004).

A clearer sense of regional growth and development is essential in planning and budgeting for future service and infrastructure provision; stormwater management programs are similar in this regard. Information about projected or expected growth is needed today to plan for and implement stormwater infrastructure that will accommodate future growth tomorrow. However, the effectiveness of stormwater management programs may be limited by outdated data related to floodplain delineations, ordinances based on inaccurate information and a lack of information sharing about future growth and locations of new development. As a result, it can be difficult for stormwater management efforts to estimate future management needs and conduct capital improvement planning.

Capital improvement planning was a motivating factor for Mecklenburg County Stormwater Services to initiate a floodplain mapping project; the information that resulted considered full build-out and 0.1 foot allowable rise. Existing ordinances were modified to include the new regulatory flood elevation and decide future development, which could save the County $300 million in potential flood damages, if an event were to occur. Additional stream water quality buffer requirements were implemented because filtering for pollutants was expected to decrease flood heights by 0.5 feet; as a result, the mapping effort will further assist the County to comply with Phase II NPDES requirements at minimal additional cost (ASFPM, 2004, p. 5).

Integrated Water Resources Management

The foundation of watershed planning is protecting water resources—ground and surface—to ensure future water quality and supply. A motivating factor for improved water resources management is, therefore, a guarantee that future development and growth will have access to

reliable and safe water supplies. A motivating factor behind integrated water resources management is to provide this guarantee at least cost and to ensure current and future compliance with federal and state regulatory requirements for water resources. Watershed planning is part of any comprehensive water resources management program that includes long-term planning and a combination of structural and nonstructural actions. For local governments, a comprehensive planning approach related to water resources would entail extensive data collection and analysis, and consideration of the current and future regulatory environment.

A simple definition of integrated water resources management suggests it is " bringing the legal and organizational mechanisms together so that all components of the water resource can be unified in the decision-making process," (Deyle, p. 387). The American Water Works Association (AWWA) describes the process of integrated resource planning as comprehensive and employing least cost analyses of demand-side and supply-side management options that is much different from traditional planning. The differences stem from the fact that integrated resources planning involves "an open and participatory decision making process, the development of water resources alternatives that incorporates the consideration of a community's quality of life and environmental issues that may be impacted by the ultimate decision, and recognition of the multiple institutions concerned with resources and the competing policy goals among them," (AWWA, p. 263). Instead of water and sewer utilities planning in isolation for capital improvements, utilities are working with public agencies; instead of environmental regulation viewed as an obstacle, environmental quality is a planning objective among multiple objectives.

Similarly, the EPA suggests that the diverse criteria or objectives involved in a watershed approach will require the involvement of diverse parties relative to their particular interests, expertise and authorities. Both, integrated resource planning and the EPA's watershed approach seek to coordinate goals and actions as well as identifying and analyzing trade-offs rather than treat external

factors as constraints (AWWA, p. 269). For example, multi-objective planning processes may help communities comply with environmental regulations through the following water quality and natural resource protection actions (www.epa.gov/owow/):

- Support watershed approaches to water quality permitting, nonpoint source pollution control, habitat protection and other water resource protection and restoration activities using Total Maximum Daily Load analyses.
- Issue NPDES permits in accordance with the state or tribal watershed management schedule.
- Tailor their Clean Water Act 319 nonpoint source management program to respond to watershed needs and ground water connections.
- Direct activities in the State Wetland Conservation Plan toward reducing wetland impacts from land and water-based activities.
- Integrate federal, state and/or local wetland permit programs with individual watershed plans that contain adequate wetland protection provisions.
- Promote the establishment of mitigation banks by providing funding for bank sponsors, identifying and prioritizing potential bank sites, and providing appropriate direction.
- Use their watershed approach to target overall source water protection areas and approved Wellhead Protection Program protection areas as high priority for various federal and state programs.
- Direct federal and state activities toward protection of high priority ground water (e.g., wellhead protection areas or other areas designated under endorsed Comprehensive State Ground Water Protection Program).
- Develop or use approved program under primacy for Phase I/II/V National Primacy Drinking Water Regulations for granting monitoring waivers under Public Water System Supervision program.
- As authorized, monitor, verify implementation, and, when necessary, enforce management actions.

The connection between distinct water related objectives such as flood hazard mitigation and integrated water resources planning approach is further illustrated by data requirements. The following commonalities exist between diverse water resource management processes:

- Ground water supplies and recharge areas;
- Surface water supplies including point- and non-point discharges, first flush of a storm, flows, rise and surcharge;
- Variation in demands and supplies due to weather and hydrology;
- Current water usage demands;
- Detailed water demand forecasts or development related projected demands; and

- Overall water carrying capacity of the basin.

The recent map modernization initiative launched by FEMA and its cooperating partners such as the State of North Carolina is one example of a data collection effort that could serve multiple objectives. For instance, EPA's Wetlands Division would be interested in using the maps to delineate isolated wetlands in addition to floodplains, whereas, water utilities may be able to use the maps for its hydrologic and hydraulic modeling component. The maps are digital, easy to access and use; the maps may be the topic of future discussions among federal resource management agencies to identify ways to improve information collection and sharing, and streamline regulatory processes with similar goals for the benefit of state and local governments.

Smart Growth/Growth Management Programs

CWP's watershed planning techniques are similar to those promoted by advocates of smart growth and comprehensive growth management programs, in which broad coordination of local policies for development achieve better results related to issues of regional concern. According the Smart Growth Office at EPA headquarters, regional cooperation and planning can minimize imperviousness at the watershed level rather than just at the site level; identify and preserve critical ecological areas and contiguous open space areas; and ensure maximum use of existing infrastructure and previously developed sites. Such regional approaches would not only achieve flood hazard mitigation and broader water resource protection but the specific objectives of the following Smart Growth Principles: preserve open space, farmland, natural beauty and critical environmental areas and strengthen and direct development towards existing communities (EPA, 2004, p. 11).

EPA highlights several local examples where the smart growth techniques used helped to achieve water resource related objectives. Clark County, Washington encourages infill development because of the stormwater management benefits associated with providing new development adjacent to existing development and locations already served by existing infrastructure. In 2002, the

county adopted an ordinance specifying the types of infill development allowed, locations where allowed and incentives such as density bonuses provided to developers (p. 27). Montgomery County, Maryland chose to implement a transfer-of-development-rights program to achieve similar goals as Clark County—ensure development is directed toward existing communities so that cost-effective infrastructure and service delivery can be provided, and open space and the natural, beneficial functions it provides is maintained (p. 22). New Jersey conducted a study finding that compact development would result in 30 percent less runoff and 40 percent less water pollution than a sprawl scenario; as a result, New Jersey's State Plan calls for increasing densities by also directing development toward existing communities and infrastructure (p. 19).

No Adverse Impact

The most well known example of smart growth and regional growth management—Portland, Oregon—is also showcased ASFPM as a NAI success story No other case study illustrates better the broad benefits of watershed planning or the commonalities between smart growth and NAI principles. Portland utilizes integrated management techniques to maintain the quality and character of its landscape as well as preserve sensitive resources and functions. Primarily, through mitigation, planning, regulations and development standards—three of the NAI building blocks—Portland addressed repetitive flood losses and site-specific flooding impacts as well as the city's regional goals for growth management. (ASFPM, 2004, p. 42)

In conjunction with its overall growth management goals, Portland seeks to avoid the following adverse impacts: a further reduction in the functional values of significant water, land and habitat resources, overemphasis on urban uses and activities, and negative effects on economic activities and livability as well as on health, safety and overall quality of life for its citizens (ASFPM, 2004, p. 42). Natural resource inventories were completed for different watersheds and basins as part of Oregon's land use goal related to wildlife habitat. The inventories were used to create the

City's environmental overlay zoning program, which was expanded to achieve flood hazard mitigation benefits in conjunction with the City's acquisition program, to achieve additional land use goals. As a result, 70 miles of stream and river frontage is protected through the acquisition of 7,960 acres of regional natural areas and greenways, and 162 acres of flooded property in the Johnson Creek Basin. The city's designation of Flood Management Areas and Special Flood Hazard Areas resulted in specific floodplain management requirements including balanced cut and fill at the site level and prohibition of development in the flood hazard area or, at a minimum, proposed building footprints outside the flood hazard area.

The city considers Johnson Creek basin a priority due to repetitive flooding costing the city $15.2 million since 1996 and water quality issues. Johnson Creek restoration efforts also resulted in a plan document as well as regulatory safeguards and programs including a fill mitigation bank, which requires "fee in lieu" payments for any action that does not balance cut and fill on a site. In other words, property owners must provide an equal amount of excavation and flood storage capacity if they fill below the base flood elevation or may elect to pay into the fill mitigation bank if chose not to balance cut and fill for whatever reason. Specific areas within the Johnson Creek Basin with significant natural resources and functions were also identified for more stringent protection and conservation measures such as prohibiting development that includes significant reductions in storage capacity of the floodway and flood fringe" or "significant impediments to the passage of flood waters." Developers must also provide evidence that stormwater runoff will be reduced and opportunities for groundwater recharge. In the floodplain, density may no exceed one dwelling unit per lot, no more than 50 percent of any site can be developed as impervious surface and no subdivisions are permitted within the Johnson Creed flood risk area defined by the City's modeling of a 10-year flood event (p. 45).

The NAI toolkit identifies specific benefits for floodplain management attributable to multiple objective management (MOM) and a watershed planning approach. Specifically, the MOM approach integrates floodplain management with broader community concerns including economic development, housing, water quality and recreation. Similar to land use plans and zoning, MOM ensures that all impacts and alternative measures are identified and evaluated. In this way, MOM achieves broader constituency interest for plan implementation. MOM also assist entities responsible for implementing specific plan actions in identifying diverse mechanisms for funding entire projects through broader support of the plan's goals (ASFPM, 2003, p. 34-36).

Sustainable Development

Protecting our natural resources for the future while also promoting communities—or people and property—to enable economic and social development represents the challenges associated with planning for sustainable communities. Watershed planning broadens land use and other local governmental planning efforts to include consideration of future or long-term community conditions, ecological limits, connections with the natural environment, consumption levels, the interconnectedness of economic, social and environmental goals and the need for holistic strategies similar to the way in which hazard mitigation seeks to build disaster resilient communities (Beatley, 1998, p. 243-255).

FEMA promotes sustainable redevelopment by encouraging the use of disaster recovery dollars while also considering the balanced concerns of a healthy community and "not just re-building damaged areas that will exacerbate existing problems and expose the community to further crisis" (FEMA, p. 5-13). If made a priority within the community, post-disaster recovery and redevelopment efforts present an opportunity to incorporate sustainability principles. FEMA highlights case studies that work with the previously flooded river recognizing that potential for repetitive flood damages exists. As a result, communities chose to relocate businesses, infrastructure

and homes at higher elevations. Rebuilding efforts in places like Darlington, Wisconsin and Valymeyer, Illinois incorporated other community priorities such as economic development, historical preservation, tourism, and energy efficiency (FEMA, 2000, p. 5-17). FEMA recognizes that some aspects or actions associated with sustainable development may be perceived as conflicting with the immediate needs of a community during a post-disaster scenario. However, FEMA also suggests that land use planning and smart growth, housing and infrastructure redevelopment have potential to yield discrete results and achieve overall community goals (p. 3-6).

IV. REGIONAL INSTITUTIONAL APPROACHES TOWAWRD FLOOD HAZARD MITIGATION

Existing research suggests that different hazard mitigation alternatives evaluated could positively reduce damages in the event of a future flood disaster. Land use and development recommendations, ranked as most effective based on the evaluation criteria used, were flawed in that none guaranteed a watershed approach *and* a clear, consistent line of authority throughout planning, implementation, and monitoring stages. In a recent assessment of development management policy distribution for flood hazard mitigation in the Tar River Basin of North Carolina, researchers concluded, "To effectively reduce flood vulnerability at the river basin scale, an institutional framework for regional coordination must be established."

David Brower continues this statement by suggesting that "coordinated planning at the regional level by municipal and county planners, as well as private conservation groups, will begin to address the inconsistencies in neighboring plans and lead to a river basin less vulnerable to floods," (Brower, et al., 2004). By establishing a regional institutional approach, problems currently faced in developing policies and coordinating plans between different agencies could be managed and more comprehensive, collaborative actions taken. The recommended course of action is to establish an approach that would implement subwatershed/watershed-level land use and development

management decisions to reduce flood damages. The following sections explore the idea of a regional institutional approach toward flood hazard mitigation.

As a specific course of action, a literature review was once again conducted but this time specific to the above notion of establishing a regional institutional approach to determine if others like David Brower support this idea. Similar sources as those used to identify and evaluate flood hazard mitigation alternatives— Interagency Floodplain Management Review Committee, academic researchers and the Association of State Floodplain Managers—were used as well as the 2002 Report for Congress by the Review Committee on the Natural and Beneficial Functions of the Floodplain. While all advocate for better integration and stronger partnerships, the Congressional Review Committee suggests that enhanced intergovernmental coordination and planning for floodplain management "could be provided through entities established for watersheds or river basins," (p. 5-5).

The Review Committee suggested a more localized version of the watershed or river basin commission formerly supported by the federal government to protect and restore the floodplain environment and, consequently, reduces flood losses. This recommendation possibly stems from the Review Committee's consideration of the impacts of human activities on floodplains as well as the current structure of floodplain management programs—either mandated or financially contingent on the federal government while administered and operated by local governments. Combined with the recommendation from academia that land use planning be the coordinating mechanism so that federal agencies are required to act in ways consistent with state and local plans, overall policy fragmentation may be minimized and the stated objective of this research may be achieved.

Similarly, in sources where some form of coordinating entity is cited as necessary to future flood hazard mitigation or other planning specializations, so too are the challenges of creating such an entity. The following sections identify these challenges that exist as well as the opportunities that

promote the idea of a regional institutional approach. However, first, this approach is described in terms of the criteria used previously to evaluate the broad range of mitigation alternatives. Finally, this paper is concluded with a description of a methodology for evaluating potential organizational structures based on different models, specific criteria and local context.

A. Why a Regional Institutional Approach?

The recommendation for a regional institutional approach toward future flood hazard mitigation is discussed below in terms of the previously identified evaluation criteria. However, the descriptions are general; a complete evaluation of this approach is dependent on the specific organizational structure of the institution including participating actors and types of coordinating strategies employed since several variations of these exist.

Geographical scope: The watershed provides the basic ecological, hydrologic and geomorphologic management unit for implementing development management and land use planning decisions related to flood hazard mitigation. Montgomery, et al., recommends watershed-scale analysis, which provides "the information required to assess [economic and ecological] tradeoffs and develop land management plans for implementing policies that are consistent with meeting management objectives," (p. 371). The development of a common framework, as the authors suggest, would facilitate integration of actions and results across multiple ownership or political boundaries and incorporate interdisciplinary, inter-agency and multi-owner objectives to prevent ecosystem deterioration or restore degraded areas. Watershed-scale analysis accompanied by watershed level actions serves as a hazard mitigation tool for implementation by a regional institution with the commitment and authority to do so.

Intergovernmental collaboration: The preferred alternative moves hazard mitigation beyond coordinated planning processes toward intergovernmental, both horizontal and vertical, collaboration. In order to achieve this extent of cooperation, communication and compromise, two

things are required: a common vision as to how to address root causes and a forum for related decision-making processes. Without a formalized vision and procedures, fragmentation among public institutions and distinct jurisdictions persists as do the great number of public agencies and jurisdictions constrained by narrow missions, general statutes and constituents' demands. More significantly, collaboration is achieved with the recognition of mutual interdependence between two or more organizations/jurisdictions (Deyle, 1995, p. 388- 393). In the case of flood disasters, multiple organizations and adjacent jurisdictions are interdependent in pre-disaster mitigation and preparedness processes as well as post-disaster response and recovery stages.

Cost effective: Similar to concerns about inefficiency related to water resources management, a regional approach toward flood hazard mitigation would help to minimize the inefficiencies and unnecessary costs among land and water management entities that result from conflicting goals, duplicative efforts and inconsistent actions. Furthermore, a watershed and multi-objective approach toward hazard mitigation would more closely resemble a rational or comprehensive planning approach that is proactive instead of crisis-driven and where problems and solutions are identified based on local resources and context rather than in a "garbage can." According to Dr. Robert E. Deyle and his research of integrated water management and hazard mitigation, this would promote a causal or means-ends relationship, and not merely temporal simultaneity, between problems and solutions that allows participants to design the most appropriate and effective solution to the problem at hand (1995, p. 389). And, the spillover effects or negative externalities associated with planning decisions may be mitigated through a more rational and collaborative approach (Deyle, 1995, p. 388).

Stakeholder involvement and legally feasible: In particular, these two criteria are dependent on the actual type of regional institution or organizational structure put in place. Both criteria highlight the importance of outreach and involvement from a diverse group of stakeholders.

For instance, without state and federal government participation there may be a lack of support and, consequently, the legality of a regional approach may be questioned or local governments may be denied the enabling legislation and, consequently, power to form a regional institution. Furthermore, since keeping development out of the floodplain remains the most effective hazard mitigation strategy, stakeholder involvement (e.g., real estate professionals, developers, home buyers, etc.) promotes the public education component required for any preferred alternative.

Land use and development authority: Land use planning and development management is critical to future hazard mitigation so that the causes of flood damages are treated and impacts minimized. With the watershed or river basin as the appropriate management unit, the way in which land use and development decisions are made and implemented must be altered in order to ensure the effectiveness of decision-making processes. Specifically, regional level authority is necessary to ensure the equal implementation of intergovernmental decisions across political boundaries and a clear and consistent line of authority for accountability purposes (Godschalk, et al, 1999, p. 216).

B. Challenges

Perhaps one of the greatest challenges for implementing a regional institutional approach is the history of regional planning in the US. In a number of planning-related specializations including transportation, housing and water resources, regional efforts have proved weak or ineffective and, in a number of circumstances such as the River Basin Commissions created under the Federal Water Resources Planning Act of 1965, have been disbanded. In an email correspondence with Dr. Robert E. Deyle, he suggests, "most of the effort in watershed planning has been focused on collaboration rather than on developing new regional institutions with regional authority. I think most folks have given up the notion of creating new institutions as too politically difficult," (July 26, 2004).

The River Basin Commission program was just one of many federal programs that created regional agencies. River Basin Commissions depended on federal funding and, as a result, its demise

was driven by the political climate of the 1980's. The American Planning Association (APA) suggests that of the 39 regional organizations created in the 1960s and 70s, only one metropolitan planning organization remained after a decade of sudden federal policy reversal in the 1980s (p. 16). Perhaps funding regional agencies was perceived as an ineffective federal expenditure given the shortcomings of such efforts. For example, the performance of the River Basin Commissions was impeded by "obligations of members to their parent organizations, the voluntary nature of the coordination process, and the limited capacity of members to speak for their organizations," (Viessman and Welty, p. 69).

Dr. Deyle uses the above quote to characterize historic regional agencies as organized anarchies in which organizational decision-making is ineffective because these agencies consist of poorly specified and inconsistent goals, uncertain processes for achieving goals and fluid participation by individual actors in the decision-making process (1995, p. 388). Consequently, regional agencies are formed to produce symbolic results (e.g., to convey a message that many significant parties have come together to deal with an issue that effects a large geographic area) and decision-making processes resemble the garbage can model described above. The ultimate impacts of regional agencies were costly processes and decisions that rarely solved real problems.

The above information largely pertains to federal efforts toward regional planning. Due to these historic failures, the federal government has refrained from establishing regional governance organizations with the exception of several high profile efforts (e.g., Tennessee Valley Authority, Chesapeake Bay Program, Everglades Restoration Project, etc.). This absence of federal mandates or funding for regional efforts has translated to an overall absence of regional agencies throughout the US. State and local perceptions of regional planning are negative, more related to methods or process rather than the concept, and succeed in maintaining this absence.

At the local level, the call to strengthen collaboration or establish a regional institutional approach is largely perceived as a threat to the long-term survival of the individual organization or agency among both small and large-sized local governments. Particularly common among local officials and managers in smaller municipalities are concerns about a potential loss of autonomy, identity, resources, and power if a regional government entity was to assume the tasks of local government agencies. In contrast, larger municipalities or counties may view regional collaboration as wasteful in light of the number of people that these public agencies serve or, more specifically, causing disruptions within the agency because of changes in organizational goals and allocation of resources. "Where organizations serve specific client groups, the clients may fear subordination of their interests to those of the collective organizational entity. This potential may cause agency administrators to fear losing public support for their organization's programs. These perceived costs, coupled with uncertainty about the outcome of coordination, can create substantial thresholds to initiating collaboration," (Deyle, 1995, p. 394).

States have traditionally assumed a limited role in planning processes except to help with the administration of federal funds to localities and to provide localities with enabling legislation to conduct planning as local government sees fit. In addition, federal programs implemented more recently have often conflicted with existing state programs and turf issues resulted between similar state and federal programs associated with flood control, water agencies, floodplain managers and emergency management services. Finally, recent federal government decisions such as modifications to cost-sharing formulas, evaluation and enforcement programs and federal level budget cuts and staff reductions convey the federal governments desire to shift federal responsibilities to the states (May and Williams, p. 72-75). In some states, recent federal actions are viewed as unfunded mandates or unwelcome burdens for state governments. However, in some states, this is an opportunity to reduce federal involvement and dependence in state government.

Most significantly, there is overall understanding among all levels of government that growth management, land use and, even, floodplain management are local decisions and even minimal state and federal input into local decision-making processes requires either a carrot or stick. All other land use controls that come down from federal, state and, similarly, regional entities, are "an anathema and an attack on private property rights. You do not have to agree with that view. You only have to know that it is very real and very strong in many areas of this country," as stated by Senator Thomas Eagleton for the *Congressional Record 129* 3, February 1983, S1071 (May and Williams, p. 70).

C. Opportunities

The literature suggests both broad and specific benefits related to regional planning in its different applications. The American Planning Association highlights the following reasons for regional planning (p. 10):

- Provision of technical assistance to local governments.
- Maintenance of forum for exploring and resolving intergovernmental issues.
- Development of regional plans to guide, direct and coordinate local planning.
- Articulation of local interests and perspectives to other levels of government.
- Establishment of two-way conduit between local governments and other agencies.

Related to flood hazard mitigation, an institutional approach organized at the watershed level could result in a variety of positive spillover effects and achieve multiple objectives. For example, effective floodplain management may result in the creation or protection of wetlands while strategically located wetland restoration efforts upstream or upland minimizes increases in base flood elevations. Property acquisition and relocations aligned with the principles of smart growth would reduce the extent of impervious surface throughout the watershed while increasing floodwater storage and conveyance in the floodplain. Though the above responsibilities lie primarily within the realm of local government, these responsibilities are also dependent on federal and state mandates and diverse funding opportunities that exist.

In addition, the above mentioned local government responsibilities span across various agencies within a specific jurisdiction and each having distinct objectives. Finally, local government activities are impacted by the land use activities of adjacent jurisdictions such as the deflection or shift of new development between jurisdictions based on the growth management policies of another jurisdiction. Regional collaboration for the purposes of flood hazard mitigation combines the assets—financial, expertise and staff— among all levels of governments and across political jurisdictions. As a result, local decision-making is based on a comprehensive knowledge base and subsequent actions are more cost-effective.

Improving the efficiency and effectiveness of hazard mitigation actions should be among local governments' higher priorities, particularly in areas where flood disasters have previously occurred. Recent changes within federal programs including organizational structure, budgets and staffing threaten local level hazard mitigation efforts that are dependent on federal assistance (technical and financial). In addition, because of recent state and federal expenditures in providing disaster relief assistance during the 2004 hurricane season, federal and state officials may call upon local governments to increase post- and pre-disaster hazard mitigation efforts or increase their share of disaster relief assistance costs. The financial savings of effective pre-disaster hazard mitigation are, therefore, great for communities.

One opportunity toward a regional hazard mitigation approach that resulted from the federal governments' recent emphasis on pre-disaster mitigation is the Disaster Mitigation Act of 2000 (DMA2000), officially known as the revised Robert T. Stafford Disaster Relief and Emergency Assistance Act. The Interim Final Rule published in October 2002 includes the final language: "Multi-jurisdictional plans (e.g. watershed plans) may be accepted, as appropriate, as long as each jurisdiction has participated in the process and has officially adopted the plan. State-wide plans will not be accepted as multi-jurisdictional plans." However, this opportunity within DMA2000 suffers

from weak language and does not amount to the development or implementation of collaborative hazard mitigation actions. Instead, multi-jurisdictional plans involve a single entity which conducts risk assessments for distinct jurisdictions within a region and identifies at least one mitigation action to be undertaken by each jurisdiction that submits documentation of plan adoption within its jurisdiction. The multi-jurisdictional planning process does not look at the broad causes of risk or the impacts of a community's actions on adjacent communities.

However, this option for complying with DMA2000 and, consequently, remaining eligible for disaster assistance funds could be strengthened if federal or state government provided additional incentives to complete regional assessments and implement mitigation actions based on watershed-wide characteristics. Or, local governments can use the DMA2000 process and framework for initiating regional collaboration and improving local decision-making before subject to additional federal or state-level requirements in the future. With the latter alternative, local jurisdictions would be able to tailor a regional approach based on a more localized context and priorities, as well as a common vision and agreed upon decision-making processes, than if a standard set of requirements for a regional approach was forced upon them by the federal government or the state.

Finally, there is an existing misperception among many concerned with governance that regional institutional approaches are doomed to fail. There are many successful models of regional approaches for service delivery and a wealth of information including evaluations and analyses of different approaches toward regionalism to learn from. Lessons learned from the literature help to explain the causal factors and political conditions that led to the establishment of regional entity, why regional efforts fail or succeed, and where regional approaches are headed in the future. For example, the APA cites a British planning professor who suggests that statewide growth management programs offer potential promise in reinvigorating regional institutional approaches

toward land use planning in the US (p. 17). Another professor cited, this one from the Department of Public Policy at that University of Colorado at Denver, suggests that regional approaches will evolve from perceptions of regional issues as articulated from already formed coalitions; as a result, "the particularized governance structures that result to address those problems will be highly idiosyncratic, reflecting, as they should, such unique circumstances as local political culture," (APA, p. 17).

D. Case Studies of Regional Planning Approaches

Despite the challenges associated with regional planning, there are many regional approaches and arrangements that exist today. Although levels of effectiveness may vary among each or dependent on whom you ask, many regional approaches employ innovative strategies as well as existing mechanisms to achieve specific goals for expansive geographic areas or broad populations. For instance, regional approaches like the Adirondack Planning Agency and the New Jersey Pinelands Commission influence local land use decisions. The Tahoe Regional Planning Agency and Portland Metro both seek to manage growth across multiple jurisdictions and, even, states—the former for a specific or special purpose while the latter provides diverse services to achieve broad land use goals. Others include private partnerships or visioning processes to promote support among diverse stakeholders including the public; Envision Utah and the Atlanta Regional Commission are two examples. In addition, there are approximately 450 regional councils of governments (COGs) across the country that provide diverse planning services to local governments and promote regional cooperation amongst member governments (www.narc.org).

Related to water resources management, the Upper Mississippi River Basin Association remains the last remnant of federal support for basinwide approaches and continues to be an effective advocate for comprehensive, non-structural approaches. Meanwhile, many state and local governments are recognizing the interconnectedness of diverse water resources issues and the

effectiveness of comprehensive management approaches for flood hazard mitigation and other water related objectives.

The Charles River Basin Natural Valley Storage Project originated in the 1970's and remains today a classic case study of an effective watershed approach toward flood hazard mitigation. The project involved all levels of government, extensive public involvement and over 7,000 acres of acquired land or easements for wetland protection throughout the river basin (Faber, p. 18-20). A FMA grant motivated Ventura County to enter into a cooperative grant with the Ventura County Watershed Protection District to develop a mitigation plan for compliance with DMA2000. The county recognized that the District, which administers the counties floodplain management program as well as various studies and projects based on watershed boundaries, possesses the appropriate expertise and knowledge (URS, p. 1-1 and 1-2). Meanwhile, Florida's Water Management Districts are examples of state created special districts enabled with the authority to administer all water resource programs— including studies and projects related to flood control, consumptive water use and land management for water resource protection—for five broad geographic regions within the state.

The detailed case studies that follow were completed to provide examples of regional approaches considered "successful" by many in the broad field of city and regional planning. To do this, it was necessary to explore regional approaches beyond any that exist for flood hazard mitigation. The case studies include examples of applied regional approaches related to transportation planning and natural or significant resources protection. This type of analysis provided specific findings—particularly related to the driving forces that induce regional approaches, information about organizational structures, and overall lessons learned—for application toward diverse planning specializations and other geographic areas. The format of the case studies was loosely based on the typology of regional growth management systems developed by Ben Hitchings

of the Triangle J Council of Governments.[4] The typology includes a thorough explanation of the determinants that led to the classification of different regional approaches—ad hoc, advisory, supervisory or authoritative arrangements—was used to evaluate potential regional approaches for flood hazard mitigation.[5]

[4] Hitchings' classification criteria was based on extensive research by the Triangle J Council of Governments and focused on regional land use planning activities only in terms of budgetary information. The case studies on the following pages were used to obtain broader information about different regional approaches including costs of general participation for local government members ; therefore, all budgetary including level of investment information in this masters project cannot be compared to the figures included in Hitchings' 1998 publication.

[5] According to Hitchings' typology, an authoritative arrangement depends on many variables in which few regional approaches meet. Therefore, an authoritative arrangement is not provided in the masters project but Hitchings' 1998 publication as well as other informational resources can be reviewed to learn about regional planning in Portland, Oregon and the Twin Cities in Minnesota.

CASE STUDY 1: COASTAL RESOURCES COMMISSION—NORTH CAROLINA

Purpose: The Coastal Resources Commission, or CRC, was created when the General Assembly adopted the Coastal Area Management Act (CAMA) in 1974. "The General Assembly hereby establishes within the Department of Environment and Natural Resources a commission to be designated the Coastal Resources Commission." The CRC establishes policies for the N.C. Coastal Management Program and adopts implementing rules for both CAMA and the N.C. Dredge and Fill Act. The commission designates areas of environmental concern, adopts rules and policies for coastal development within those areas, and certifies local land-use plans.

Mission: Per the North Carolina Coastal Management Act, Title 15A North Carolina Administrative Code, Chapter 7 Coastal Management, its functions are listed below.

Geographical scope: Twenty-county region and areas of environmental concern (AEC).

Functions: Responsible for 1) the preparation, adoption and amendment of the State guidelines for coastal areas which are intended to facilitate State and local government compliance with the planning and permit-letting aspects of the act; 2) final approval of county land use plan to ensure consistency with goals of the coastal area management system and State guidelines; 3) designation of geographic areas as areas of environmental concern including wetlands, estuarine waters, renewable resource areas (i.e., watersheds or aquifers that are present public water supply sources), navigable waters and natural hazard areas; 4) review and approval of local implementation and enforcement program related to its zoning area and permitting of development 5) hearings of permit appeals and petitions for variances.

Participation/membership: The CRC consists of 15 members appointed by the Governor. Twelve of the 15 members must have experience in a particular area of expertise, such as marine ecology, development or local government. Three members may be "at-large." Membership is staggered with all members serving four-year terms.

The Coastal Resources Advisory Council (CRAC), a 45-member group that provides the CRC with local government perspectives and technical advice. CRAC members represent coastal counties and cities, regional councils of government and state agencies. Members serve at the pleasure of the appointing body.

Members of the Coastal Resources Commission and Coastal Resources Advisory Council serve on one of two standing committees. The Implementation and Standards Committee focuses primarily on policies related to coastal development activities. The Planning and Special Issues Committee focuses primarily on policies related to CAMA land-use planning.

The Division of Coastal Management, in the Department of Environment and Natural Resources, provides staffing services to the CRC, implements CRC rules and issues CAMA permits.

Other mandates and programs: In addition to its mandate CAMA, CRC operates other programs including a land acquisition program referred to as the NC Coastal Reserve Program and the Coastal and Estuarine Water Beach Access Program.

Control over infrastructure development: None.

Review authority (related to regional land use planning): Extensive; per functions above.

Funding: For fiscal years 2000-2001, the CRC's budget was $5,255,245. The CRC receives 36 percent of its revenue from state grants, the rest is funded through the federal government, permit fees and contracts with other state agencies (e.g., DOT) for project permitting. There appears to be no revenue sharing between participating counties and municipalities.

Level of investment: In 2000, the population in the 20-county region was 826,019 according to the US Census; thus, CRC spent approximately $6.36 per capita.

Source: NC Division of Coastal Management website: http://dcm2.enr.state.nc.us/. Last accessed April 2, 2005.

CASE STUDY 2: TAMPA BAY ESTUARY PROGRAM—FLORIDA

Purpose: In 1990, Tampa Bay was designated as an "estuary of national significance" and accepted into the EPA's National Estuary Program (NEP). The program focused on controlling nitrogen loadings to the Bay and recovering 12,350 acres of vital sea grass. In 1998, local governments and regulatory agencies participating in the Tampa Bay NEP and totaling 13 signed an interlocal agreement to ensure that the Comprehensive Conservation and Management Plan (CCMP) developed to achieve the stated goal above would be effectively implemented. This binding agreement "emphasizes regional cooperation and regulatory flexibility that allows the Parties to select cost-effective and environmentally beneficial bay improvement options for their communities, so long as the goals of the CCMP are met." The Tampa Bay Estuary Program (TBEP) resulted from this agreement

Mission: The mission of TBEP is to implement the CCMP and achieve the specific goals contained within the document related to water and sediment quality, bay habitats, fish and wildlife, dredging and dredged material management, and spill prevention and response.

Geographical scope: Three-county region or 2,200 square mile watershed (with the exception of three counties with minimal land contained in the watershed's boundaries).

Functions: The parties participating in the interlocal agreement are responsible for 1) serving as the coordinating body for the Action Plans and assisting the parties in gathering information necessary for the development/implementation of Action Plans; 2) reporting annually to the Policy Board on each Party's compliance with the interlocal agreement and implementation of their Action Plans; 3) preparing a baywide environmental monitoring report every two years; 4) assisting parties in locating grants and other funding for the implementation of Action Plans; 5) coordinating outreach programs to promote restoration activities; 6) coordinating the evaluation and updating of the CCMP every five years; 7) conflict resolution; 8) establishing a process for determining member status related to goal achievement and maintenance; 9) overseeing research projects; 10) developing action plans to address goals not being addressed in other Action Plans; and 11) participating through the Tampa Bay Regional Planning Commission in the Florida Coastal Zone Management Program to ensure Federal consistency review process to ensure federal projects are consistent with the goals of the CCMP.

Participation/membership: TBEP's structure relies on two inter-related boards—Management Board and Policy Board— as well as individual party participation.

The Policy Board is responsible for programmatic policy-making, decides the types of advisory committees needed such as the current Technical Advisory Committee (TAC) and the Citizen Advisory Committee (CAC) and program or committee membership. The governing responsibilities of the Policy Board also include budget development, notification, reporting and approval processes, creation and adoption of program bylaws and final reviews of Action Plans and Action Plan Supplements for consistency with CCMP goals and general acceptability. Board membership is comprised of eight voting directors representing the signatories of the interlocal agreement plus one non-voting member representing the EPA.

The Management Board is primarily responsible for the management of the TBEP as well as first reviews of all Action Plans and Action Plan Supplements for Policy Board approval. "An affirmative majority vote of the Management Board is required in order for any individual Action Plan [or Supplement] to be recommended to the Policy Board, except that a negative vote from any Regulatory Agency with jurisdiction in over the Action Plan will result in a negative recommendation." The membership of the Management Board currently consists of representatives of each of the parties to the interlocal agreement and co-chairs of the TAC and CAC as voting members. Representatives of the EPA and USACE are considered non-voting members.

Other mandate and programs: The CCMP is considered an ecosystem management conceptual design in which more detailed ecosystem management agreements may be developed upon approval of subsequent Action Plans, per the "Ecosystem Management Law" (Section 403.0752 of the Florida Statutes). Such agreement may coordinate the legal requirements and timelines of the Parties, including permit processing, project construction, and compliance with development orders and regional and local comprehensive plans.

CASE STUDY 2: TAMPA BAY ESTUARY PROGRAM—FLORIDA (CONTINUED)

Control over infrastructure development: Indirectly; some influence over and coordination of stormwater and wastewater infrastructure development.

Review authority (related to regional land use planning): Limited; individual Action Plans are reviewed and approved by TBEP's Policy Board, and goals and actions contained in approved Action Plans are required to be included in local comprehensive plans and capital improvement plans.

Funding: For fiscal years 2000-2001, TBEP's budget was $755,000. The agreement called for a 50/50 federal and state/local match; however, the state/local match exceeded the federal government allocation for FY 00-01. The breakdown was as follows: local governments (including the counties of Hillsborough, Manatee, and Pinellas and the cities of Clearwater, St. Petersburg, and Tampa) contributed 37 percent, multiple basin boards contributed 18 percent through Southwest Florida Water Management District state appropriations, and the remaining 45 percent was from the federal government through the NEP.

Level of investment: In 2000, the population in the 3-county region was 2,184,432 according to the US Census; thus, TBEP spent approximately $0.35 per capita.

Source: TBEP Comprehensive Coordinated Management Plan and Interlocal Agreement accessed via the TBEP website: www.tbep.org. Last accessed April 2, 2005. Phone correspondence with TBEP's Executive Director Dick Eckenrod on March 30, 2005.

CASE STUDY 3: METROPOLITAN TRANSPORTATION COMMISSION—CALIFORNIA

Purpose: Metropolitan Transportation Commission (MTC) is the metropolitan planning organization (MPO) for the nine county San Francisco Bay area. MTC was originally founded through state legislation in 1970. With later federal funding and mandates—namely, the Transportation Equity Act for the 21st Century and Intermodal Surface Transportation Efficiency Act (ISTEA)—MTC's role in decisionmaking processes related to regional transportation and, especially, financing transportation improvements was broadened.

Mission: Along with other transportation related agencies in the region—Bay Area Toll Authority (BATA) and Service Authority for Freeways and Expressways (SAFE)—MTC seeks to knit the region's 4,500 buses, railcars and ferries, 1,400 miles of highway, 20,000 miles of local streets and roads, and eight toll bridges into a smooth-functioning network tha safely gets the region's nearly 7 million residents where they need to go, when they need to get there.

Geographical scope: Nine-county region or 7,000 square miles including the counties of San Francisco, Napa, Marin, Alameda, Contra Costa, San Mateo, Santa Clara, Solano and Sonoma.

Functions: MTC primarily serves five functions including 1) developing a regional transportation plan every three years and, specifically, identifying how anticipated federal, state and local transportation funds will be spent in the nine-county Bay Area over a 25-year planning horizon in a way that conforms with federal air quality standards; 2) voting to allocate, and keeping accurate accounting of, funding to mass transit, local streets and roads, highways, freight facilities, and bicycle and pedestrian routes in the region; 3) coordinating the area's transportation network to ensure that the network delivers benefits to every Bay Area community; 4) managing specific components of the Bay Area's diverse transportation network including SAFE, call boxes, tow trucks, multi-purpose telephone information line and others through diverse partners; 5) advocating for state and federal policy changes to obtain increased funding and cut bureaucratic red tape in ways that will assist local governments in the area.

CASE STUDY 3: METROPOLITAN TRANSPORTATION COMMISSION—CALIFORNIA (CONTINUED)

Participation/membership: A 19-member policy board guides MTC's work. Each of the most populous counties—a total of five—has two representatives. Fourteen out of the 19 commissioners are appointed directly by local elected officials (for the five counties with two representatives on the board, the respective board of supervisors selects one representative, and the mayors appoint another; the four remaining counties appoint one commissioner to represent both the cities within that county and the county board of supervisors). In addition, two members represent regional agencies — the Association of Bay Area Governments and the Bay Conservation and Development Commission. Nonvoting members—a total of three—are appointed to represent federal and state transportation agencies and the federal housing department. Carrying out the Commission's directives is a staff of some 130 persons including an executive director and two deputy directors—one for policy and one for operations.

MTC also consists of an Office of General Counsel and the following standing committees included: Executive, Administration, Legislation, SAFE Operations, BATA Oversight, Planning and Operations, and Allocations and Programming. Committees are charged with considering current issues, making recommendations to the board and overseeing related programs. Each committee includes a chair, vice-chair and an MTC staff liaison and secretary in addition to its members.

Other mandates and programs: In 1997, the state legislature passed the Transportation Development Act, giving MTC increased authority in the selection of state highway projects and allocation of transit expansion funds. That same year, the state created the Bay Area Toll Authority (BATA) to administer the base $1 toll on the San Francisco Bay Area's seven state-owned toll bridges. Metropolitan Transportation Commission (MTC) began operations as BATA in 1998; as a result, MTC oversees toll hikes and subsequent allocations such as Regional Measure 2 in 2004.

Control over infrastructure development: Extensive; primarily through funding allocation decisions related to local government transportation projects (allocated $403M in FY2000-01) and administration of BATA revenues (totaling $303M in FY 2000-01).

Review authority (related to regional land use planning): Limited; provides trainings and grant monies to local governments for land use planning as part of Transportation for Livable Communities (TLC) and Housing Incentive Program (HIP).

Funding: For fiscal years 2000-2001, MTC's budget was $46,334,364 (enterprise funds only; figure does not consider expendable funds which totaled $33.5M or assets). MTC received, in revenues, 39 percent in federal grants, 27 percent of from project revenues of local and state agencies, 23 percent from county sales tax through the regional Transportation Development Act, 8 percent in state grants, and 2 percent in interest and other revenues sources.

Level of investment: In 2000, the population in the 9-county region was 6,783,760according to the US Census; thus, MTC spent approximately $6.36 per capita.

Source: MTC's Annual Report 2001 accessed via the MTC website: www.mtc.ca.gov. Last accessed April 2, 2005.

E. Summary of Findings from Each Case Study

The case studies present three models of regional approaches across different specializations and each with a differing degree of impact on regional land use. The fundamental characteristics of each are compared in Table 2 below while relevant findings for potential application toward other specializations or geographic areas are summarized for each case study on the following pages.

Table 2: Summary of Case Studies

Characteristics	CRC	TBEP	MTC
Impetus	State	Local (w/ current arrangement but originally Federal)	Federal (w/ current arrangement but originally State)
Local Government Participation Requirement	Mandated	Voluntary	Mandated
Description of Arrangement Type	Special purpose regional agency	Interorganizational network	Regional allocation agency
Geographic Area Served	9,363 sq. miles	2,200 sq. miles	7,000 sq. miles
Number of Participating Local Jurisdictions	20 counties	3 cities, 3 counties	9 counties
Influence on Regional Land Use	Authoritative	Supervisory	Supervisory
Budget (FY 2000-01)	$5,255,245	$755,000	$46,334,364
Primary Funding Source	State	State/local	Federal

Coastal Resources Commission—North Carolina

The impetus behind the creation of the CRC was the state and its recognition that a "two-tiered" system involving the regulation of development throughout a region and local-level land use planning was needed to preserve and manage NC's coast as an ecological and economic resource (Armingeon, p. 3). The CRC satisfies the role of rulemaker and regulator at a broader than local level but allows local governments to continue to have a major role in local policy-making through the development of local land use plans.[6] The CRC also assists in consistency determination processes with state and federal statutes such as the NC Coastal Management Program and the US Coastal Zone Management Program. Meanwhile, the CRAC provides technical assistance and expertise to local governments during land used planning and permitting processes to ensure that CAMA rules are understood and included in plans and developments.

The CRC acts as a special purpose regional agency like others mentioned earlier—Pinelands Commission, Tahoe Regional Planning Agency and the Adirondack Park Agency—all of which have the authority to control development "in environmentally sensitive areas or areas having statewide significance" (APA, p.19). APA suggests that the enabling or creation of these agencies by the state considers regional and local political traditions and issues but, as in the case of the CRC, entails some restructuring of state and local level governance. The CRC somewhat resembles an authoritative regional system in that it can require changes in local plans or other codes; however, its scope is limited to rulemaking and plan approval, as opposed to developing a regional plan and administering regional implementation strategies. Furthermore, commission members are citizens appointed by the governor and the work of CRC is primarily funded through the state suggesting that CRC serves more as an extension of a state department than a well-defined regional planning body.

[6] Local land use plans are mandated through CAMA for county governments; cities and towns are not required to have an adopted land use plan.

Perhaps, due to the diverse representation of the CRC, the large involvement of state staff particularly from NC's Division of Coastal Management, and the role of local governments on the CRAC, the CRC and its enabling legislation has been regularly evaluated and critiqued, as well as legally challenged, since its inception. Significant criticism of the legislation and the work of the CRC over the past few decades were related to the impacts of CAMA on coastal area growth and development; studies over the years have shown that CRC's procedures and regulations have not slowed growth in the twenty CAMA counties.

The CRC proved responsive to evaluation findings and criticism in 1998 when CRC issued a moratorium on 1999-2000 land use plan updates to review its current guidelines and make improvements. At this time, the Division of Coastal Management reported on the status of over 200 recommendations resulting from a previous state-commissioned study. Despite some modifications, such as the creation of the Coastal Reserve Program and addition of new requirements so that implementation information and basinwide water quality plan findings are incorporated into local land use plans, many question why CAMA has had little effect on curbing growth and development along NC's coast. For Darlene Kucken, Basinwide Planning Unit Supervisor at NC Division of Water Quality, suggests that the program includes major shortfalls (3/29/05). For one, the regulations lack strong implementation requirements for approved land use plans and mechanisms for ensuring or enforcing implementation. Also, CAMA regulations fail to address the cumulative impacts of coastal development as well as development occurring in the broader watershed. For instance, if the proposed location for a development is not in an AEC than it is permitted without review by the CRC and not considered for its regional impacts.

Tampa Bay Estuary Program—Florida

TBEP operates with a regional plan—the CCMP—and oversees compliance and tracks the progress made toward realizing the goals specified in the CCMP through a variety of tools and

techniques. According to Hitchings' typology, TBEP represents a supervisory system that could be considered less of governance restructuring and more as an independent alliance of government entities (Eckenrod, p. 232)

The impetus behind the TBEP was originally federal and, specifically, the USEPA through the acceptance of the Tampa Bay region into the NEP. Tampa Bay NEP, at its onset, was specified as having a life of five-years in which time the CCMP was developed and approved through mandated local, state and federal government participation. It was at the end of this time period, that the participants of the Tampa Bay NEP decided that the responsibility for achieving the goals of the CCMP—and, consequently, the avoidance of future regulatory actions related to the overall health of the bay—was ultimately that of each member government. "The commitment was envisioned to be binding in the sense that a government could be identified and held accountable for failing to meet its part of the goal," (Khator and Brunson, p. 158).

Khator and Brunson studied TBEP after the termination of its status as a NEP and suggested that the interlocal agreement signed by thirteen governmental parties is a successful example of a "voluntary, self-driven, nonhierarchical network," (p. 159). This conclusion is largely based on findings from a survey of over 40 participants involved in TBEP in some way. Besides scientific data that suggest that TBEP is achieving its nutrient reduction goals for at least part of the bay, Khator and Brunson's survey identified a 100 percent satisfaction rate among respondents asked whether the group did the right thing in creating an interlocal agreement.

The high level of satisfaction is directly related to the promotion of a clearly defined goal and existence of a common vision. With the five-year process of developing the CCMP completed, member governments' sole goal was to establish a binding agreement for CCMP implementation. Furthermore, the CCMP development process identified the overall or net environmental benefits of coordinated and comprehensive management strategies. An interlocal agreement would enable

flexibility in the context of permitting processes for local governments while regulatory agencies would be ensured compliance related to various regulations. Finally, the surveys revealed that members kept their expectations low related to participation in the TBEP, which helped to minimize political conflicts. Members expected to obtain access to information and scientific knowledge and were not concerned about equity issues related to TBEP's organizational structure or fiscal-responsibility sharing (p. 163-164).

TBEP's current executive director, Dick Eckenrod suggested that a number of factors led member governments to successfully reach consensus and establish an interlocal agreement. He further states that the following factors are all equally important to the overall success of TBEP: a history of cooperation in the Tampa Bay region related to estuary issues and scientific analysis, peer pressure or the fear of appearing uncooperative in the eyes of peer groups and the public in an effort with broad public and political support, continuity of service and ownership of participants in a process based on principles of watershed management, an understanding that the bay's health is important to the region's economy, and affordable implementation since CCMP implementation costs were estimated to be less than 1 percent of governmental entities' expenditures at the time of signing the agreement (p. 232). All respondents in Khator and Brunson's survey mentioned that "building cooperation with others" was either very important or important as a factor for continuous participation in the network. Almost all respondents thought that "finding non-regulatory solutions to problems" was significant and 91 percent said that "knowing what others were doing" was another important factor (p. 160).

Metropolitan Transportation Commission—California

MTC is the metropolitan planning organization (MPO) for the San Francisco Bay Area or, in other words, MTC serves as a regional allocation agency that required a restructuring of local governance in the region (APA, p. 18). MTC differs from other MPOs in that it was originally

created with state legislation. The passing of the 1991 Intermodal Surface Transportation Efficiency Act (ISTEA), its 1998 successor, the Transportation Equity Act for the 21st Century, or TEA 21, and 1990 amendments to the federal Clean Air Act (CAA) then expanded the responsibilities, requirements and decision-making authority of MTC related to the Bay Area's transportation system. MTC's primary responsibilities include the development of the Bay Area's Regional Transportation Plan (RTP) and reviewing and deciding funding requests for transportation projects from member governments based on consistency with the RTP.

MTC is a regional organization with supervisory land use influence throughout the region. The commission operates with a regional plan and its financial allocation power created through state and federal legislation ensures plan implementation in the region. MTC does not have the authority to review or change land use plans or ordinances. Due to the interconnections between land use and transportation planning in terms of growth and development, many argue that this inability of the regional institution promotes traditional growth patterns. Consequently, the negative impacts of sprawl are exacerbated and more dollars must be spent for transportation projects to accommodate low-density growth and more automobiles.

To update the RTP every three years, MTC uses land use information, including existing data and future projections, developed by the Association of Bay Area Governments (AGAG), the region's COG. "The projections are a major factor in how investments are evaluated," suggests former Deputy Executive Director, William F. Hein who further states that a deviation from these projections toward a shift in thinking about where people should live and work is unrealistic. Bounded by state and federal legislation, MTC does not have the authority to change land use throughout the region and, therefore, cannot decide an alternative scheme or ignore the reality of where growth is occurring. Furthermore, the Clean Air Act Amendments of 1990 disallows the

deviation from standard land use projections, which may misrepresent actual growth patterns and permit urban areas to avoid conformity requirements (Hein, 1996).

MTC, through its allocation authority, selects projects for funding based on consistency with the stated goals of the RTP—improve mobility, promote equity, enhance sensitivity to the environment, support economic vitality and support community vitality. Back in 1996, Hein cautioned the organization about using this power to leverage "desired" land uses particularly related to the last goal above, which describes alternatives to sprawl. Hein states that the most difficult obstacle for using MTC's financing role as leverage is "finding a reasonable nexus between the allocation action and the desired outcome," to ensure decisions are legally and publicly supportable. That same year, MTC approved or allocated approximately $2.5 billion a year for transportation projects and programs (Hein, 1996).

Federal law requires that the allocation decisions of MTC be fiscally constrained; in other words, the RTP can only include projects for which reasonable finance mechanisms are identified. At the same time, the transportation system consistently ranks as a high priority issue among Bay Area citizens. Fortunately, the state's early role in creating regional transportation planning agencies results in continuous support of MTC through grants and legislation. The Transportation Development Act, enacted by the state legislature in 2000, established a quarter of a cent retail sales tax collected by the state and returned to each county for transportation projects. In FY 2000-01, MTC received 23 percent of its revenue through the legislation and 68 percent of its FY 2000-01 allocations to transit agencies and local governments region-wide (or $ 274,272,154) (MTC, p. 19). In addition, the public has shown their support of funding transportation measures at the ballot box. November 2004 elections results illustrate that five out of six counties with ballot measures passed a sales tax increase in support of transportation improvements and a region-wide bond measure was

passed for the BART Earthquake Safety Program which would raise property taxes to issue $980M in general obligation bonds (www.mtc.ca.gov).

Because of merging operations, state created revenue enhancements, public support and federal grants, MTC is able to support broader land use goals through innovative programs and partnerships despite a lack of authority in this capacity. For example, MTC created the Transportation for Livable Communities (TLC) in 1998 to provide funding for local transportation projects that "are developed through an inclusive community planning effort, provide for a range of transportation choices, and support connectivity between transportation investments and land uses," (www.mtc.ca.gov). In FY 2004-05, MTC provided over $18M in capital grants awarded to eleven local governments through the TLC program. Each of these local governments provided the 20 percent local match required by the program to fund a variety of projects including streetscape improvements, bikeways, parks and plazas.

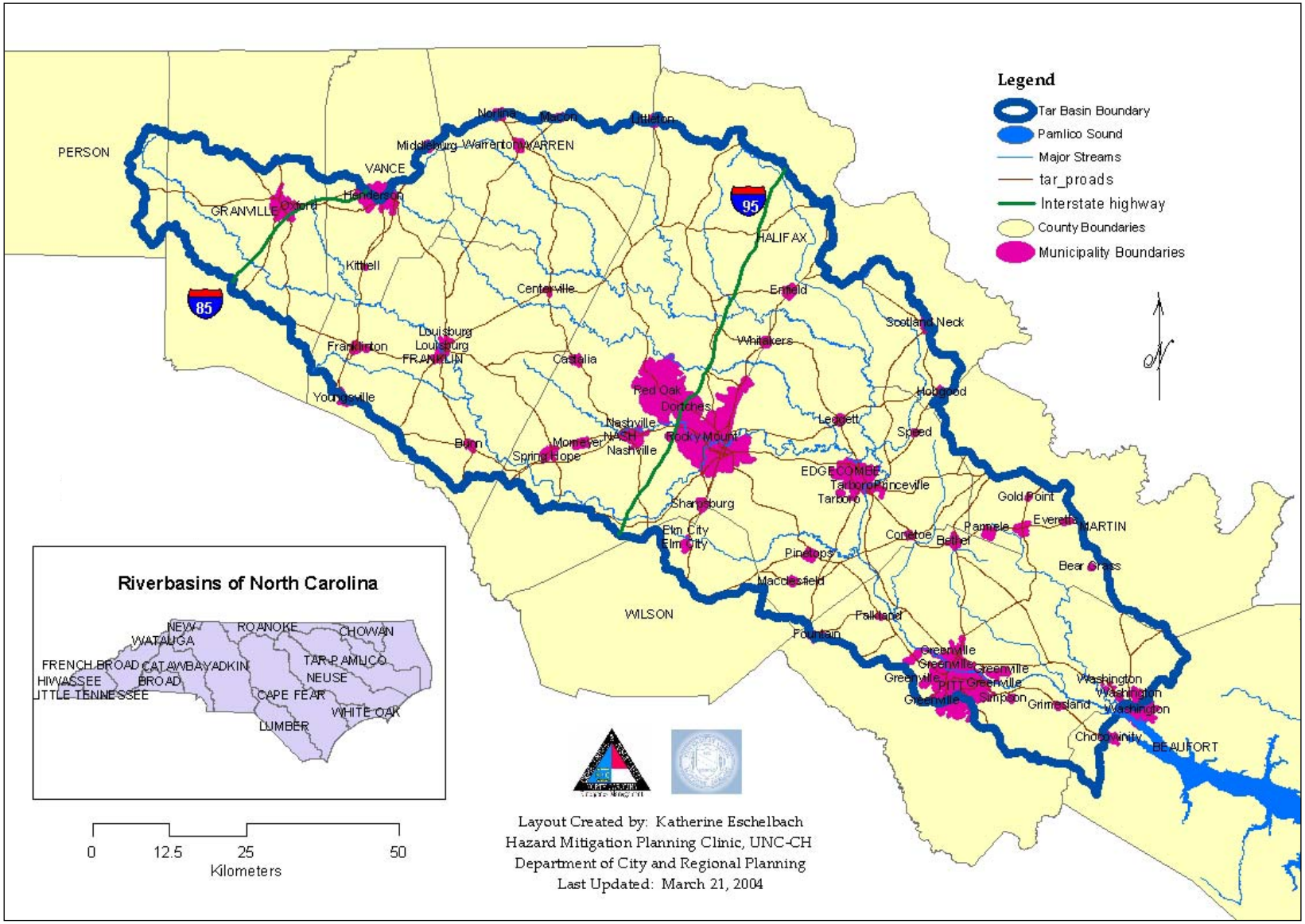
V. TARGET STUDY RIVER BASIN: THE TAR RIVER BASIN

A. Basin Overview

The Tar River Basin is part of the Tar-Pamlico River Basin, the fourth largest river basin in North Carolina. Located in the northeastern part of the state, the Tar-Pamlico River Basin is entirely located within the State's boundaries. The Tar River originates in the counties of Person, Granville and Vance, and flows through Nash, Edgecombe and Pitt counties before becoming the Pamlico River and emptying into the Pamlico Sound. This region is located within a larger estuarine system that comprises 30,000 square miles making it the second largest in the county following the Chesapeake Bay (www.apnep.org/pages/regions.html). The Tar River Basin is, thus, part of a system with impact on a significant natural resource for ecological diversity as well as economic benefits including commercial fishing, tourism, recreation and resort development.

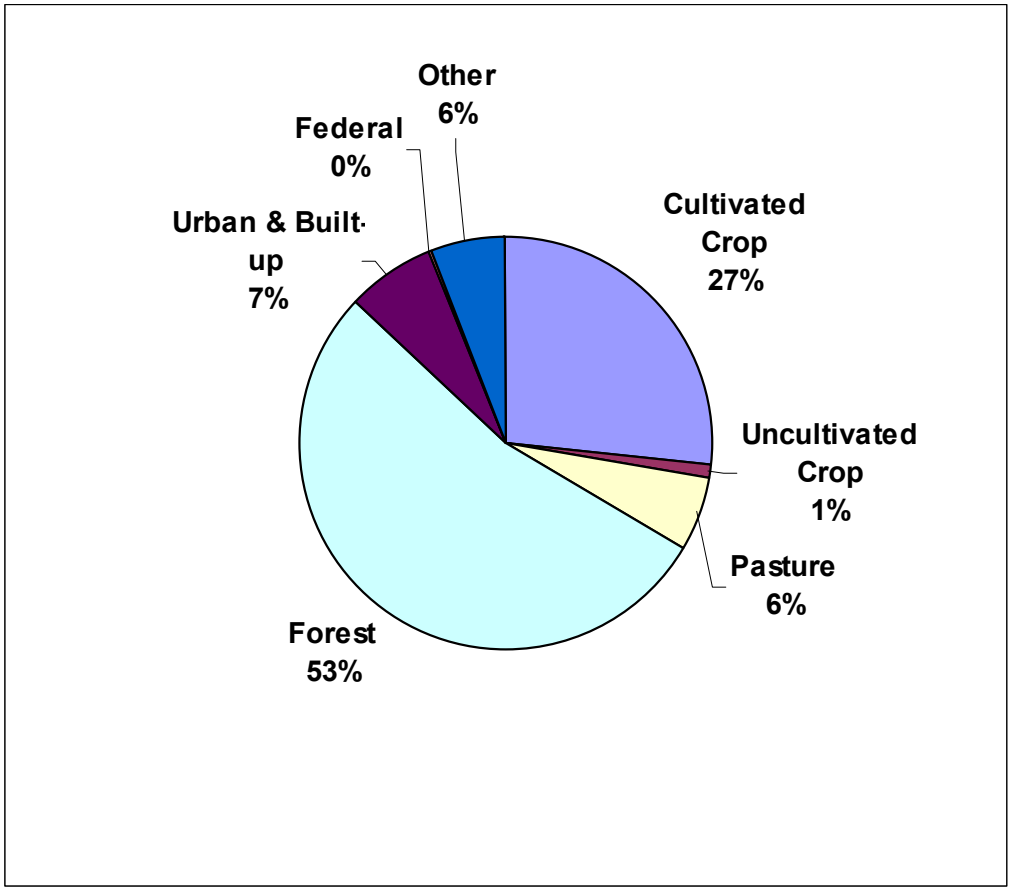
The Tar Rive Basin comprises 2,039,400 acres (or 3,3187 square miles) in total. Within its boundaries are forty-six municipalities and twelve counties. There are relatively few large population centers within the basin—mainly Rocky Mount and Greenville—with most of the municipal populations as 2,000 persons or less. A total of 18 municipalities and 11 counties experienced positive population growth between 1990 and 2000 (Brower, et al., p. 5). According to the Division of Water Quality (DWQ), the six subbasins comprising the Tar River Basin will grow in population at an overall rate of 16 percent between 1996 and 2016. DWQ notes that the uppermost subbasins are expected to grow at very high rates— approximately 20 percent—during this period. This rate of growth is just below the rate expected for the subbasin containing the large population centers of Greenville and Rocky Mount (h2o.enr.state.nc.us/basinwide/ tarpam_wq_management_plan.htm).

Figure 1. General Features of the Tar River Basin



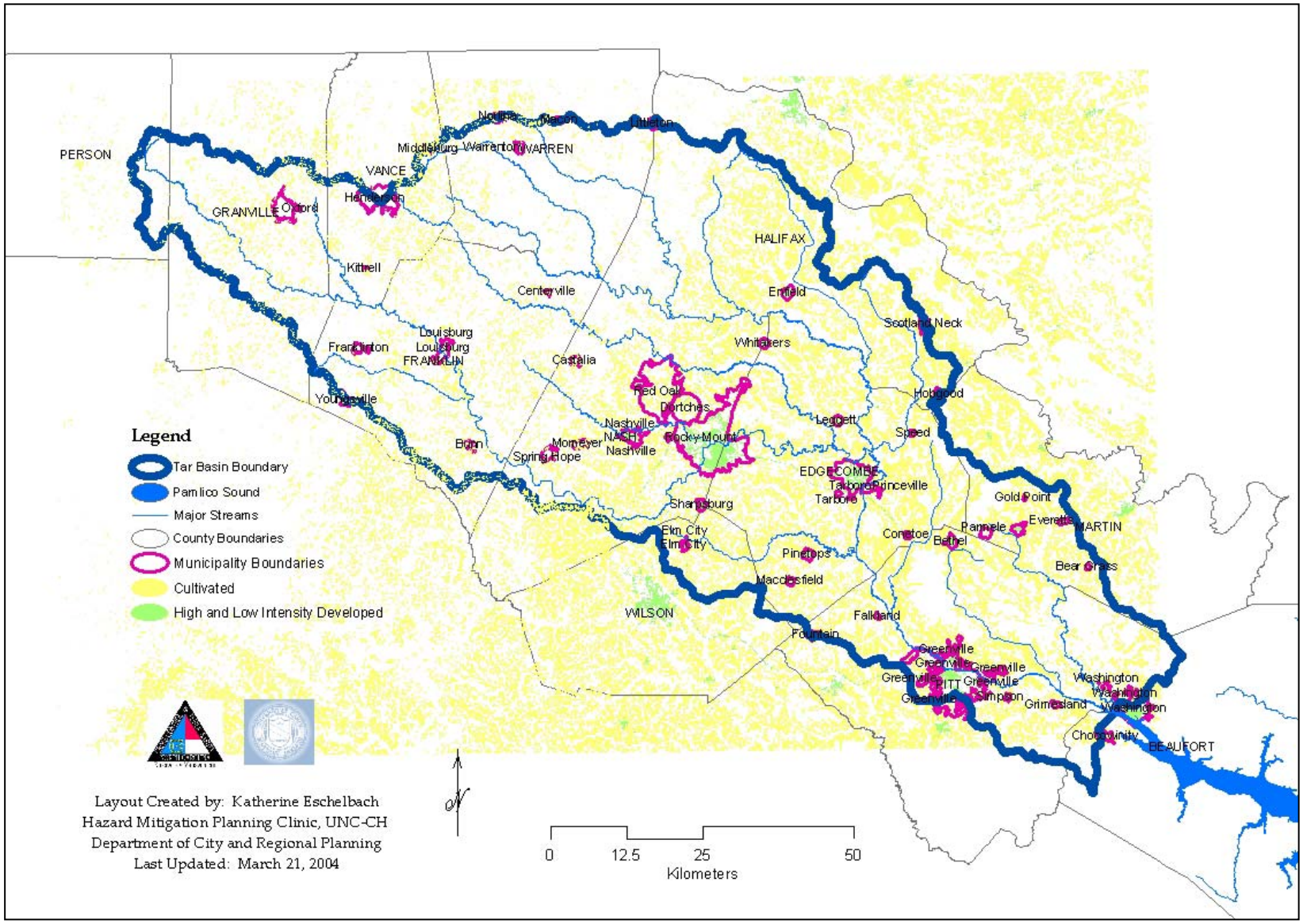
The Tar River Basin is predominately rural and comprises largely forest or cultivated crop lands (see Figure 2 below). The largest urban or built-up areas, primarily Rocky Mount and Greenville, are located in the lower half of the river basin. Figure 3 on the following page illustrates the extent of impervious surface in the river basin and highlights the urban areas as high and low intensity development compared to cultivated crop or forestland. Two interstates (I-95 and I-85) connect the river basin with the rest of the state as well as Virginia to the north.

Figure 2: Land Cover in the Tar River Basin (1997)*



Source: USDS NRCS, NRI, updated June 2001

Figure 3: Impervious Surfaces of the Tar River Basin



Brower, et al., suggests that roughly 7.5 percent, or 187,965 acres, of the Tar River Basin is located within the FEMA Q3 floodplain.[7] However, the risks of flooding in the river basin are actually more extensive than simply the amount of identified floodplain; Brower, et al., further suggest that several other features may increase the flood risks for people and property within the basin. In particular, the extensive amount of hydrologic features covering the basin's land area exacerbates flood vulnerability. The Piedmont region of North Carolina that comprises the upper portions of the basin is characterized by rolling topography and highly erodible clay soils while the bottom or Coastal Plains portion of the basin is comprised of low-lying areas with extensive floodplain (Brower, et al, p. 5).

The Tar River Basin is part of one out of two state basinwide programs to reduce nutrient loadings in ecologically significant estuaries. In 1989, the state Environmental Management Commission (EMC) designated the entire Tar-Pamlico River Basin as Nutrient Sensitive Waters (NSW) due to frequent, large-scale algal blooms and fish kills in the Pamlico estuary. As a result, the state's DWQ first implemented a point-source trading program for publicly owned wastewater treatment plants (POTWs) and industry throughout the basin, referred to as the Tar-Pamlico River Basin Association.[8] In 1994, the EMC developed a non-point source (NPS) nutrient management strategy as a result of monitoring and evaluation findings indicating that voluntary NPS programs were not able to achieve specific reduction goals. The new mandatory program includes a set of four rules: nutrient management (related to fertilizer application), stormwater, agriculture and riparian buffers (http://h2o.enr.state.nc.us/nps/tarpam.htm). These NPS rules and the agreement between POTWs participating in the Tar-Pamlico River Basin Association will be reviewed and updated for approval by the EMC in April 2005 (Gannon, 3/29/05).

[7] Q3 floodplain data is a digital representation of certain features related to flood risks obtained from scanning hard copies of FEMA's Flood Insurance Rate Maps and vectorizing a thematic overlay of flood risks.
[8] According to Rich Gannon at DWQ, the last of the industry representatives in the Association is no longer participating due to the relocation of the company.

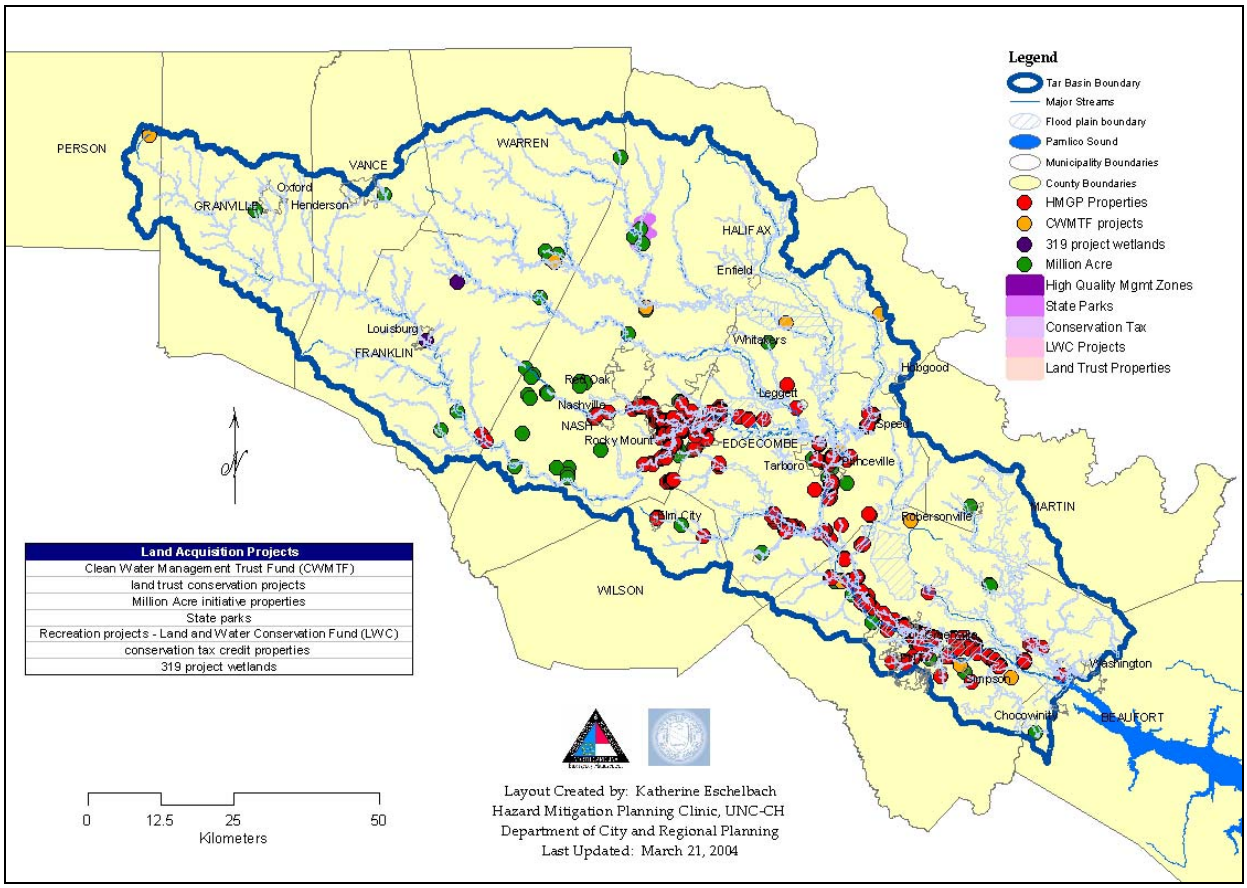
The local jurisdictions and entities most impacted by the basin's NSW designation are those participating in the Tar-Pamlico River Basin Association—Belhaven, Bunn, Enfield, Franklin Water and Sewer Authority, Greenville, Louisburg, Oxford, Pine Tops, Rocky Mount, Spring Hope, Warrenton, Washington, and Tarboro. Association members agreed to develop estuarine models and studies, conduct evaluations of plants, provide annual monitoring reports, and provide minimum payments for administration and implementation of agricultural BMPs to reduce nitrogen loads by 30 percent and maintain phosphorus loads according to 1991 levels. In addition, the stormwater rule requires 11 total jurisdictions to develop and implement stormwater programs based on potential nutrient contributions to the estuary. These jurisdictions include the municipalities of Greenville, Henderson, Oxford, Rocky Mount, Tarboro and Washington, and the counties of Beaufort, Edgecombe, Franklin, Nash and Pitt (http://h2o.enr.state.nc.us/nps/tarpam.htm).

In 1992, the state began mandating jurisdictions with land use regulatory authority in watersheds containing public water supply sources to develop ordinances, maps and management plans for the protection of surface waters from NPS pollution (i.e., stormwater runoff) (http://h2o.enr.state.nc.us/wswp.htm). As a result, the following jurisdictions in the Tar River Basin must implement, to differing degrees based on a watershed classification system, BMPs, buffers and restrictions on density and land uses: the municipalities of Greenville, Hobgood, Leggett, Louisburg, Nashville, Oxford, Rocky Mount, Speed, and Tarboro, and the counties of Edgecombe, Franklin, Granville, Halifax, Nash, Person, Pitt, Vance and Wilson.

Brower, et al., make note of other watershed protection programs and land acquisition efforts that, though not regulatory, place significant restrictions on development. In particular, the Ecosystem Enhancement Program identifies targeted watersheds throughout the Tar River Basin for wetland protection and restoration efforts. In addition, diverse funding sources are used to acquire land in environmentally sensitive areas including those prone to flooding. Brower, et al., mapped the

sites of land acquired through a number of these programs—Hazard Mitigation Grant Program (HMGP), Clean Water Management Trust Fund (CWMTF), NC Million Acre Initiative, Land and Water Conservation Fund, land trust conservation projects, conservation tax credit properties and Section 319 project wetlands. The map below illustrates the clustering of these land acquisition efforts and benefits provided in the lower portion of the Tar River Basin. Brower, et al., conclude that "the assortment of acquisition efforts taking place in the [throughout the Tar River Basin] shows an encouraging level of coverage that can contribute to reducing flood vulnerability basinwide" (p. 27).

Figure 4. Tar River Basin Land Acquisitions

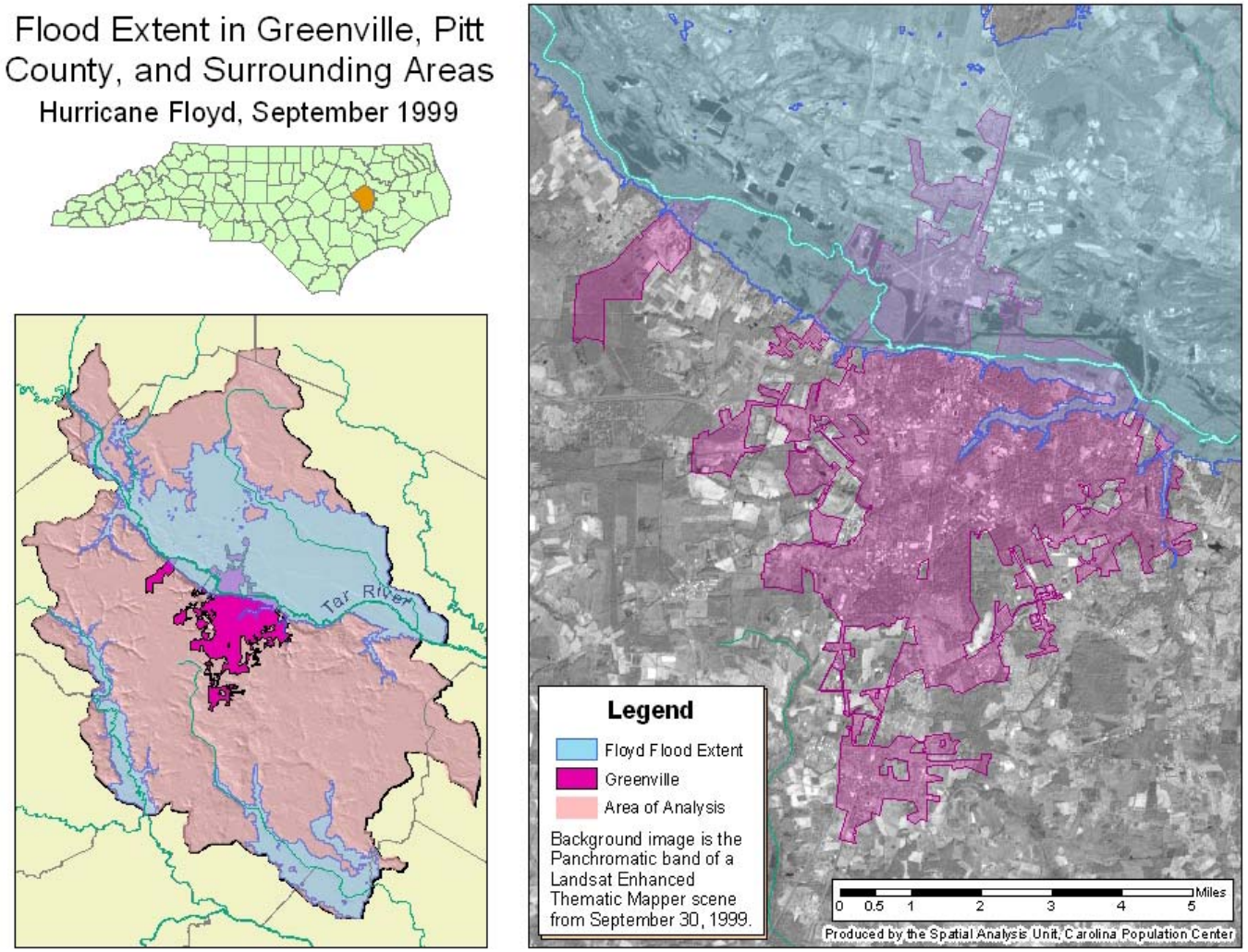


The Tar River Basin was selected as the focus of this masters project due to prior experiences with major flooding including 500 year flood events in some parts of the basin during Hurricane Floyd in 1999. NC Division of Emergency Management estimated total damages in the eastern part of the state alone at $6 billion as a result of Hurricane Floyd. The Tar River crested at 24 feet above flood stage (http://www4.ncsu.edu/~nwsfo/storage/cases/19990915/) and representatives of local governments in the Tar River Basin suggested that up to 40 percent of the jurisdictions' land area was covered by water. Figure 5 on the following page shows the extent of flooding that occurred in Greenville during Hurricane Floyd relative to it jurisdictional boundaries.

Hurricane Floyd resulted in a heightened level of awareness about flood risks in the Tar River Basin among state and local governments, particularly related to hazard mitigation. A second reason for selecting the Tar River Basin as a study area was the availability of data about local policies with influence on flood hazard vulnerability. This information was made available through NC CGIA, while Brower and the Hazard Mitigation Clinic at UNC-CH analyzed and mapped the relevant data to draw specific conclusions about the distribution of policies across the river basin.

Brower and his team suggest that the overall level of effort is encouraging but flood prevention and property protection efforts are spotty, or unevenly distributed throughout the river basin. "Some requirements for development, such as BFE, are much more prevalent than expected and can serve as examples for all jurisdictions to follow within the river basin. Other requirements are not as regularly employed across the river basin, although a few good examples were found such as special requirements related to flood hazard protection in zoning and subdivision ordinances (p. 27). In particular, the clustering of policies and stricter requirements in the lower part of the river basin is likely due to previous experiences with flooding in these jurisdictions at lower elevations. However, the same level of prevention and protection is needed in the upper portions of the basin

Figure 5. Hurricane Floyd Flood Extent Map (September 1999)



Source: Maps created by FEMA's Mapping and Analysis Center (MAC). Maps obtained from UNC Population Center's website: http://www.cpc.unc.edu/projects/floyd/flood_extent.html.

in order to significantly contribute to flood vulnerability reductions throughout the river basin.

The assessment of development management tools in the Tar River Basin resulted in the following conclusions (p. 28):

- Jurisdictions in the river basin must modify development management policies in a coordinated as a next step in the policy-making process.
- River basin scale hazard mitigation plans should be encouraged.
- Land acquisition efforts should be coordinated in order to form an interconnected effort.
- An institutional framework for regional coordination must be established to effectively reduce flood vulnerability at the river basin scale.

These findings combined with the projected population growth and related increased development in the Tar River Basin highlight the significance of development policies or, in other words, mechanisms already existing within the river basin as the most effective method for flood hazard mitigation. Increased impervious surfaces in the upper portions of the basin can contribute to a higher volume of water reaching streams at a faster rate during a flood event throughout the basin. The next section describes six jurisdictions—three municipalities and three counties—from across the river basin that were targeted for interviews and contributed local government perspectives on regional approaches toward flood hazard mitigation. The development management policies of each jurisdiction are also described in the next section.

B. Jurisdictions Interviewed

Representatives of local government were asked to participate in interviews about local hazard mitigation planning processes resulting from DMA2000 and the feasibility of moving flood hazard mitigation toward a regional or watershed approach. Specifically, participants were asked to respond to a set of questions covering the following categories: DMA2000 plan development and adoption, plan implementation, regional planning efforts in jurisdiction, state and federal programs related to hazard mitigation, and regional approaches for flood hazard mitigation. The interview

questions for each type of interview—staff, city/county manager, and elected officials—are included in Appendix C.

Fifteen interviews in all were conducted with mitigation planning staff, city/county managers and elected officials from the following jurisdictions: the municipalities of Nashville, Rocky Mount and Greenville, and the counties of Edgecombe, Vance and Warren. The jurisdictions were originally selected based on the following criteria: 1) approximately 50 percent or more of the jurisdiction's land area was located within the Tar River Basin; 2) the local hazard mitigation plan developed for compliance with DMA2000 was produced in-house or by local government staff; 3) local development management policy information was included in Brower's assessment of the basin's flood vulnerability; and 4) jurisdictions selected for interviews ensured wide geographic coverage of the entire basin (i.e., upstream and downstream communities). However, the interview process later determined that three out of the six jurisdictions did not produce the DMA2000 plans in-house and instead relied on regional COGs to complete multi-jurisdictional hazard mitigation plans for final approval by FEMA. These jurisdictions remained as part of the data collection effort since the COGs worked closely with local staff to develop the plan and using external labor to complete the plan was fairly typical across North Carolina.

According to Brower, et al., all six jurisdictions participating in interviews have zoning ordinances. Of these jurisdictions, only one county and one city have flood specific zoning requirements included in zoning ordinances. Edgecombe County has flood specific zoning requirements related to stream buffers, flood hazard overlays, and watershed protection overlays. The City of Rocky Mount utilizes flood hazard overlays. Particularly for the municipalities, this record follows the trend in which 12 out of 15 municipalities with zoning in place do not have any flood specific zoning requirements; "This means that most of the municipalities have the power to use zoning as a development management tool to reduce flood vulnerability, but are not doings,"

(Brower, et al., p. 16). Comparatively, 4 out of 10 counties with zoning in place do not have flood specific requirements contained in zoning ordinances.

The survey of jurisdictions related to subdivision ordinances revealed that all jurisdictions interviewed, or six out of six, have subdivision ordinances. However, only one of these jurisdictions—Rocky Mount—has flood specific subdivision requirements contained within the subdivision ordinance. The study highlights that few jurisdictions within the Tar River Basin employ this development management tool; specifically, only 15 percent of the municipalities and 17 percent of the counties in the Tar River floodplain.

All of the municipalities and counties in the Tar River floodplain have flood damage prevention ordinances as required by NFIP. Brower suggests that this type of ordinance therefore can act as a development management tool within a jurisdiction; however, the full impact of the ordinance is dependent on the Bees—residential and commercial—within each ordinance and mapped. While seven jurisdictions include no additional freeboard in the ordinance for residential developments, most jurisdictions specify a 2-foot freeboard. However, one county that participated in an interview for this masters project impressively specified a 3-footboard. The other counties and municipalities that participated in interviews all specify 2 foot freeboards in their flood damage prevention ordinances. Brower, et al., notes that one municipality included in both the assessment of development management tools and interviews specified a lower freeboard requirement for commercial development compared to residential. Otherwise, all other jurisdictions' commercial BFE specifications were equal to residential Bees.

The first hazard mitigation plans completed in five of the jurisdictions interviewed were developed as early as 1999 to ensure participation in federal recovery and mitigation programs. Only one local plan out of the six included in the data collection process was a stand-alone plan; the other five jurisdictions either initiated or participated in a multi-jurisdictional plan. All jurisdictions

included in this analysis participate in the NFIP; four out of six also participate in CRS and have a current rating of 8.

C. Findings from Interviews

A complete summary of participants' responses is included in Appendix D while findings from the interviews are presented in this section. Preliminary findings were shared with several experts in the field of hazard mitigation, basinwide planning and regional planning including state governmental staff, faculty at the University of North Carolina's Department of City and Regional Planning, representatives of local COGs and a key participant in the community watershed organization. Input from these experts was added to the findings, where appropriate, to provide meaningful information based on the socio-political environment, legal issues and regulatory climate in North Carolina and the Tar River Basin. The conclusions are organized according to broad topics for consideration during the next step of this masters project—determining an appropriate regional institutional approach toward flood hazard mitigation in the Tar River Basin.

Opportunity for Regional Approaches: The Tar River Basin represents a geographical area willing to go above and beyond the bare minimum requirements, if within available local government resources, to ensure the protection of its people and property from future flood damages. This opportunity results from the region's previous experiences with flood disasters and a current concern about water resource issues related to water/sewer infrastructure needs. However, burdensome and uncoordinated state and federal requirements, in conjunction with the passing of time since Hurricane Floyd, could jeopardize the implementation of proactive approaches for hazard mitigation at the local level. In other words, opportunities exist for alternative practices or innovative arrangements among local governments but this window may not last forever.

Mitigation as Loss Prevention: Modifications to existing ordinances were emphasized as the primary mechanism for implementing prevention mitigation actions; a possible negative

consequence may be a continued focus on jurisdiction specific approaches as opposed to broader regional coordination or collaboration. In addition, utilizing "government administrative or regulatory actions or processes" for mitigation purposes is often perceived as conflicting with development or growth which can hinder actual implementation of this category of mitigation actions. This conflict was at the center of an intense public debate for one jurisdiction within the Tar River Basin, resulting in the revoking of an ordinance that would have prohibited development in the 100-year floodplain.

Participants in Regional Hazard Mitigation: Regional approaches mean different things for different representatives of local government. Specifically, there is a general recognition that planning processes for regulatory compliance and/or development are increasingly becoming more complicated requiring expertise from multiple local governmental departments. Engineering, public works and planning staff are the representatives of local government attending many regional or state-led efforts. However, elected officials were suggested as the local government representatives at meetings of more successful COG, MPO/RPO and economic development regional planning efforts. As a result, regional processes would involve several layers or teams of government representatives from each jurisdiction.

Regional Planning as a Mandate: The challenges associated with regional approaches are broad and more complex than the literature suggests. Consequently, top-down mandates represent the most effective way to mitigate challenges associated with turf issues and territorialism, limited knowledge of alternatives at the local level, different interests across jurisdictions or the overall lack of a regional mindset. The second most frequently mentioned challenge related to regional approaches—the lack of a formal mechanism—presents a viable option to address the different obstacles identified. For this reason, the state could serve as an effective impetus for a regional approach to hazard mitigation. However, the general feeling about mandates is negative;

complementary incentives would be needed to promote support among local governments. The state has the knowledge and expertise to obtain the necessary resources and provide "carrots" with the "stick."

Scope of Regional Hazard Mitigation Planning: While a multi-objective approach (i.e., water quality and quantity in addition to flood hazard mitigation) was preferred among representatives of local governments, it represents a great restructuring endeavor both in and between local governments. Any new mandates or incentives administered for watershed-wide planning processes must be sensitive to the fact that jurisdictions differ in size, extent of local resources and experience in implementing hazard mitigation actions. Furthermore, some jurisdictions lie within more than one river basin and there is a growing concern about the complexity of the regulatory environment and regulatory impacts on development and growth in the future. Streamlining multiple regulatory processes should be emphasized in future water resources management approaches.

Potential Institutional Arrangements: The state should have a lead role in determining the regional institutional arrangement required for effective hazard mitigation. Consequently, the state will need to support such an institutional arrangement with supplemental staff, funding, data and other forms of technical assistance. For example, state-provided data and technical assistance were extremely beneficial for those most intimately involved in the hazard mitigation planning process at the local level. A possible model is the MPO/RPO arrangement, implying both a federal and/or state leadership role, in which localities receive transportation funds through participation in the regional planning process. However, local governments in the Tar River Basin may be hesitant since this alternative, in reality, has meant the imposition of state priorities with little regard for local issues exists. Finally, regional planning processes are often relegated to area COGs; as a result, local governments assume that all regional planning efforts are solely the responsibility of COGs. COGs

may not be able to produce support across different departments or equally among all representatives of a local government to modify and coordinate development plans and land use ordinances throughout a region.

D. A Discussion of Potential Basinwide Approaches in the Tar River Basin

Potential basinwide approaches for flood hazard mitigation in the Tar River Basin were considered by combining 1) the information collected about other regional approaches; 2) what is known related to local context in the Tar River Basin; 3) interview responses of local government representatives; and 4) the perspective of others whose work focuses on issues related to flood hazard mitigation, basinwide planning and regional approaches in North Carolina. Specific elements of regional approaches—such as geographic scope, legal and political feasibility, and financing mechanisms, etc.—are described on the following pages for potential implementation in the Tar River Basin. However, due to the analysis completed to get to this point, it is clear that actual implementation of a regional approach would be difficult. This section of the analysis begins with a discussion of a much-needed impetus or driving force for a regional approach and, overall, considers the following question: *which elements of a regional approach can be "sold" to those needed to participate in such an approach?*

All three case studies evaluated, as well as many other existing regional approaches, began with an external impetus such as federal or state legislation as opposed to regionwide recognition of a crisis or need. Even TBEP, touted as a successful "voluntary" regional approach, began with a prior planning process mandated by the federal government. Today, TBEP continues it work toward coordinated implementation of the CCMP based on many factors including a perceived threat of strict federal regulation on local development if implementation is not deemed successful. Local governments in the Tar River Basin confirmed the need for an impetus from outside the basin

during interviews. Staff from state governmental departments suggested that the state would also need an impetus if expected to move in a new direction toward regional flood hazard mitigation.

A federal mandate is discouraged for several reasons. For one, the state of North Carolina began requiring local hazard mitigation plans before DMA2000. The new federal rules, written for broad application across all states, complicated hazard mitigation planning for local governments in the state and were viewed as regressive or containing unnecessary and duplicative requirements. In addition, the checklists used during the review of hazard mitigation plans failed to recognize actual mitigation efforts that exceeded the bare minimum requirements of the federal government.

The state could fix these deficiencies in the federal rules by implementing targeted legislation that ensures local governments are able to meet federal requirements in the most cost-effective way. Enacting state legislation, as opposed to federal legislation, would also allow the state to target regions or basins based on priorities, such as areas that have experienced previous disaster events, as opposed to forced new legislation for the entire state. Particularly in regions where flooding downstream is an identified hazard and upstream development is occurring, the goals of DMA2000 are equally if not more important for state government which is increasingly having to find new ways to pay for disaster relief programs with each passing year.

Furthermore, the model for a state enabled regional approach already exists in North Carolina. Article 7 of North Carolina Administrative Code Title 15A, Chapter 7, Coastal Management—the statute that created CAMA and the CRC—begins with the following language:

> "This Article establishes a cooperative program of coastal area management between local and State governments. Local government shall have the initiative for planning. State government shall establish areas of environmental concern. With regard to planning, State government shall act primarily in a supportive standard-setting and review capacity, except where local governments do not elect to exercise their initiative. Enforcement shall be a concurrent State-local responsibility."

The model is based on consistency both vertically between local, state, and federal (i.e., Coastal Zone Management Act) governments and horizontally across local governments along the

coast. However, several changes may ensure that the program is viewed more as a forum for obtaining technical assistance and information, increasing or supplementing staff capacity and sharing in funding for project implementation rather than a new layer of government or expansion of state authority, which is undesirable in the Tar River Basin. Furthermore, the overall impact of CAMA suggests that greater efforts are needed for implementation of land use plans after approved by the CRC. Perhaps, more local government support or control of the process is needed while the state ensures that the stated goals and quantifiable objectives of the program are met.

The fundamental modification to the CRC model needed for implementation in the Tar River Basin would be the membership of the primary policy-making board. For a regional approach to be supported and successfully implemented, member governments must feel as if they play a large role in decision-making processes that significantly impact local resources and development. However, such a role for local governments would need to be accompanied by a set of standards determined by an entity other than member governments. Otherwise, the regional entity would function more like COGs, which "fail to make good regulatory enforcers since COGs are owned by local governments in the region" in that participation is voluntary and member governments pay dues (Hitchings, 3/31/05).

TBEP's regional approach is based on a voluntary agreement; however, the term "voluntary" may not be the most appropriate since all parties felt the looming threat of federal or state intervention related to CCMP implementation. In any case, significant lessons learned by the participants of TBEP can be applied to a potential regional approach in the Tar River Basin. TBEP representatives suggested that a major reason for participating was to know what others were doing related to impacts on the bay as well as the networking and shared learning related to CCMP implementation within each jurisdiction. Representatives also suggested local cost savings through information and expertise sharing as well as broader economic benefits by ensuring that each

jurisdiction fulfills its requirements in protecting a regional asset. Most significant for local governments was the regulatory flexibility provided by the state and federal governmental agencies as all parties worked through the details of the interlocal agreement. The agencies' objective was to ensure local government implementation of the CCMP while member governments wanted assurance that local projects with net environmental benefits would not be disallowed based on agency permitting process. The agencies agreed to streamline permitting processes and implement flexible review processes while local governments agreed to implement of the CCMP through local action plans.

Mutually beneficial agreements must be incorporated into the process of creating state enabling legislation and subsequent procedural processes for a regional approach. Essentially, all parties must agree to an adaptive management type approach where standards are set by the state and local government members determine how best to achieve quantifiable objectives put forth by the state. Monitoring and collaborative learning between state and local governments as well as other stakeholders (i.e., COGs, experts in the field, citizens, etc.) are the mechanisms in which local programs or policies are modified across all jurisdictions. In the event that all parties agree that the standards and related objectives are unobtainable, the state must commit to a reevaluation of the standards or offer greater assistance to local governments to achieve the standards.

Several local governments currently participate in MPOs and suggested that this might be a model for potential application toward flood hazard mitigation. The MPO can be a great example of local governments working together to create a regional plan and, subsequently, developing projects for implementation that are consistent with the goals of the plan. However, there are fundamental differences between transportation improvement projects and hazard mitigation that weaken the model. First, MPOs rely on a constant stream of funding from federal and state government in amounts that do not compare to the steadily decreasing amounts of funding available for local

hazard mitigation planning and projects. Most MPOs, including the case study highlighted, do not have authority to modify local land use and, as a result, end up paying increased amounts to accommodate sprawling development. Finally, local governments are not guaranteed equal or proportional funding opportunities by participating in MPOs.

In North Carolina, MPOs act similar to COGs and, in some instances, COGs serve as the MPO in the region. According to one staff member of a MPO in the state, "being a part of an MPO doesn't do all that much to help municipalities get funding. The biggest thing that the MPO here does is to prioritize projects collectively and send that list to the State in hopes that projects get included in the State Transportation Improvement Plan. The NC Department of Transportation (NCDOT) has not historically given urban areas a pot of funds to be divided amongst the various locales within their purview," (Gibbs, 4/1/05). The staff member above further stated that the MPO offers its member governments staff expertise on roadway design, roadway alignment definition and other technical problem solving assistance similar to state COGs related to various other issues.

The enabling authorization of MPOs in the State of North Carolina highlights a particular problem or obstacle at the state level related to regional approaches. Dr. Burby refers to the problem as a "competition for control of funds" and questions whether a state agency would allow a regional entity to disburse its funds (4/4/05). Current state funding requirements and federal grant programs would need to change so that regional issues addressed at the most appropriate scale possible rank highly according to funding evaluation criteria. For instance, the state's Division of Emergency Management should allocate hazard mitigation planning funds for plan update processes to a regional entity based on the number of participating local governments. The funding amount should not only increase by a flat amount for each jurisdiction participating but with additional funds so to act as an incentive for and recognition of collaborative approaches.

Currently, grant programs for hazard mitigation planning and projects do not allow COGs or other non-governmental entities to be a sub-grantee.[9] In DMA2000 multi-jurisdictional planning processes, COGs served as "the point of contact for grant administration and hazard mitigation plan development" but were not allowed to serve as "the designated agent for a planning grant," (www.dem.dcc.state.nc.us). Similar funding policies of the federal and state government would hinder a basinwide approach toward mitigation planning since it would require each local government to apply and receive grants separately and then allocate toward a regional process. This negates a potential benefit for participating in a regional process where member governments identify potential grant sources together and create a system to apply and receive grant funding collaboratively. Furthermore, the current system could raise equity issues if each jurisdiction participating in the regional process were to receive different amounts for either planning or project grants.

Other federal grant programs such as FMA or PDM are competitive and limit the number of grants a jurisdiction can receive in a given period. Thus, local governments would benefit from a regional approach and enhanced state support of sub-applications from a region in terms of pursuing these grants. FEMA would need to change the eligibility requirements of these programs to ensure that a collaborative approach between state and local governments is able to apply and receive these grants. Furthermore, such an approach should receive additional credits or points during grantor evaluations for attempting to address basinwide impacts and root causes of flooding.

Most significantly, FEMA must change DMA2000 interim rules to allow basin-level plans to occur where jurisdictions are interested in working together to effectively address flood hazards. Final rules should expand the geographic scope of the all-hazard multi-jurisdictional mitigation

[9] The state receives the initial funding from the federal government and, therefore, is considered the grantee. Similarly, local governmental agencies submit grant sub-applications to the state and, subsequently, the state submits these in the form of grant applications to FEMA.

planning process in regions where flooding is identified as a significant hazard. These regions should be able to submit one basinwide plan that includes a regional vulnerability assessment and jurisdiction specific mitigation action plans that incorporate the findings from the regional assessment. The collaborative approach would also identify basinwide objectives, monitoring systems and regular reporting procedures across local governments to ensure equal implementation throughout the basin.

The overall goal of flood hazard mitigation is to reduce property and human losses in the event of a flood. Hazard mitigation is different from other planning processes in that evaluating the success of a specific approach requires a disaster to occur; in this sense, most people would rather forego such a test due to the potential damages and costs. Therefore, the foundation of a regional approach or program for flood hazard mitigation would require basin-level standards or predetermined quantifiable objectives based on available findings from post-disaster assessments and literature about best practices. State government representatives participating in a regional approach with local governments should have primary responsibility for developing basin-level standards. State determination of these standards would ensure that the state's investment in a regional approach is worthwhile and help to minimize state/taxpayer provided assistance in the event of future flooding.

The following are suggestions for basin-level standards that could be achieved through a mandated regional approach: cap on the overall percentage of impervious surface throughout the basin including the headwaters of local subwatersheds,[10] number/acreage of floodplain acquisitions throughout the basin, and number of denied permits for developments proposed in floodplains. Additional standards or even incentives based on the implementation of various watershed protection tools for locating development outside the floodplain, creating contiguous areas of open

[10] DWQ suggests the 14 digit hydrologic unit in which first, second and third order streams are located.

space and reducing or maintaining current levels of impervious surface could be devised for future implementation. A complete list of these tools and descriptions of each are included in *Section III, Conveying the Benefits of a Watershed Approach.*

A flexible approach that allows specific goals to be met through a variety of mechanisms could eventually lead to the implementation of a multi-objective or broader water resources management approach. Local governments confirmed that water resource issues within the basin—water quality, water quantity, and hazard mitigation—are interrelated so all should be addressed simultaneously because of the 'domino effect.' In addition, a multi-objective approach would be more efficient because the expertise, time and effort gathered together to address one issue could address related issues and the discussion of more than one issue may ensure participation from jurisdictions in which flood hazard mitigation is not a primary interest. The benefits related to a multi-objective approach are numerous—diverse funding opportunities, common data collection/analysis, increased support of BMPs that serve multiple purposes, growth determinations based on the carrying capacity of the basin, sustainable development, etc. However, the resources and changes to the regulatory environment that would be needed to implement a broad water resources management authority are extensive.

A more immediate step toward a multi-objective end could be the identification of a regional issue of concern related to a specific water resource issue and identification of ways to incorporate other water resources management issues into the program. For instance, including Division of Water Quality staff in a regional program for flood hazard mitigation could highlight the linkages between flood hazard mitigation actions and improved water quality and promote more unified local government support for different state programs. Local governments required to participate in the Tar-Pamlico Basin Association may begin to think more about land acquisitions in the floodplain that would fulfill developers or landowners' offsite partial offset option for riparian buffer

protection. Inclusion of Division of Water Resources' staff may help to identify potential basin projects for inclusion in the State Water Resources Development Plan, which could provide additional state funds for multi-objective projects in the Tar River Basin.

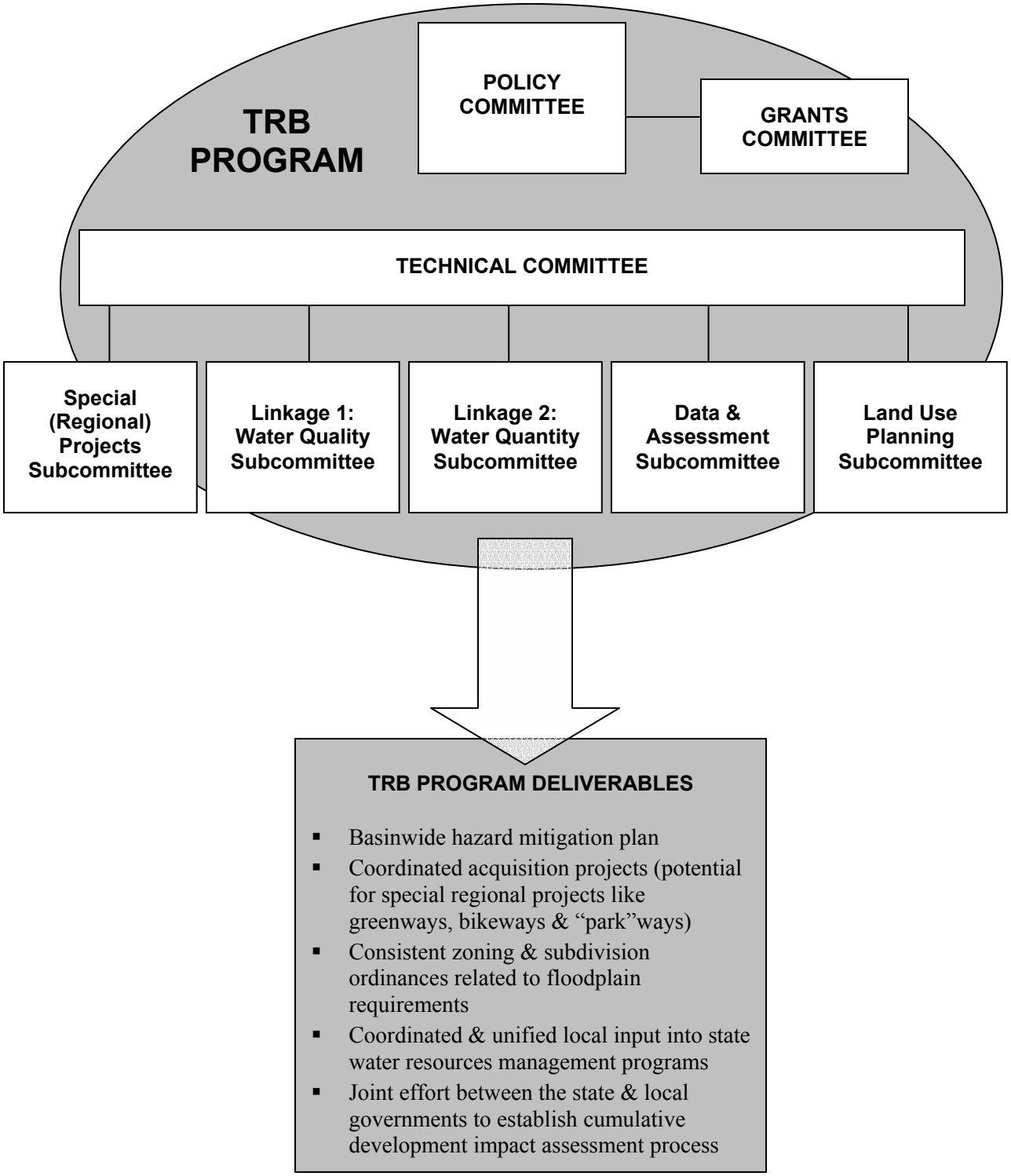
VI. CONCLUSIONS

A. Recommendation: A Regional Institutional Approach for the Tar River Basin

The stated goal of this masters project is to move flood hazard mitigation beyond coordinated planning processes between different jurisdictions toward a basinwide planning approach. The literature, interviews, expert input and findings compiled throughout the development of this final paper confirmed the need for a basinwide approach to effectively reduce flood hazard vulnerability while also suggesting that the implementation process for such an approach would be challenged. Thus, this paper concludes with a recommended regional institutional arrangement to achieve flood hazard mitigation and wide-ranging land use goals in the Tar River Basin while recognizing that implementation of such an arrangement will likely be a slow and tedious process for the state of North Carolina and local governments. The recommended approach is designed to broaden flood hazard mitigation efforts through strong regional collaboration, existing local land use mechanisms and diverse watershed protection tools.

The proposed organizational structure illustrated on the following page would be implemented through state legislation calling for the creation of a new program specific to the Tar River Basin. The program's mission would be "to create a forum for state and local governments to implement broad approaches for issues of significant concern within the Tar River Basin including flood hazard mitigation and other water resources related challenges to achieve cost-effective solutions and meet federal/state regulatory requirements." As a result, the state would enable local governments to coordinate local policies and regulations, develop regional projects and obtain

Figure 6: Potential Organizational Structure for the TRB Program



legislative appropriations and various grants on behalf of its member governments. State appropriations and funding through the restructuring of state and federal grant programs would serve as the primary sources of program revenues. Finally, the general language of the legislation would allow the program to evolve in the future if state and local participants were to determine that other water resource issues or new/amended regulatory requirements needed a basinwide discussion and coordinated action across jurisdictions.

The TRB Program allows for flexible and network-based approaches but with the ultimate goal of achieving state determined standards for reducing flood vulnerability in the basin. Therefore, participation would be mandatory for all local jurisdictions—county and municipal— in the Tar River Basin as well as representatives of the state's Divisions of Emergency Management, Water Quality and Water Resources. Program members would establish subsequent memorandums of understanding with federal agencies including FEMA, USEPA and NRCS as determined necessary. Mandatory participation requirements must explicitly state the direct and indirect benefits or incentives for each participant, which are identified in Table 3 on the following page.

The organizational structure includes mandatory member government participation in the "policy committee." Specifically, this committee will comprise a local elected official (with city/county mangers serving as alternate members) from each municipality and county within the basin. This committee's first responsibility would be to engage in a consensus process toward the development of organizational and administrative procedures related to voting processes, member status requirements, mechanisms for member government reporting and information sharing, agenda-setting and subcommittee formulation. The state should provide the policy committee with relevant information and model documents as well as third-party facilitation services, if necessary, to expedite this process.

Table 3: Summary of Member Benefits

State Agencies	Local Governments
▪ State determined standards for decreasing flood vulnerability within the basin will be met ▪ Targeted audience for providing information and technical assistance ▪ Consistent floodplain management and local ordinances throughout the basin ▪ Centralized information related to local government activities with impact on flood vulnerability ▪ Unified input from local governments about agency rules, regulations and processes ▪ Streamlined plan review process due to state involvement in basinwide (hazard mitigation) planning process ▪ Fewer (hazard mitigation) plans to review/approve development of one basinwide plan with jurisdiction specific action plans	▪ Ability to determine the basinwide actions required to meet state standards and decrease flood vulnerability within the basin ▪ Hazard mitigation plan update processes would be completed by the TRB Program and, thus, result in one basinwide plan; local governments would be responsible for updated action plans only ▪ Streamlined regulatory processes through working relationship with state agencies ▪ Access to state provided information and technical assistance related to a wide variety of topics including CRS, CWP's watershed protection tools, Smart Growth and No Adverse Impact ▪ Sharing of staff, expertise and information during the implementation of state/federal regulations as well as regional projects ▪ Sharing of lessons learned related to local political processes, land use decisions and development ▪ Assistance with identifying and applying for diverse grants ▪ Potential direct and indirect benefits associated with regional projects related to flood hazard mitigation and other water resource related objectives

The on-going responsibilities of the policy committee would include: 1) completing comprehensive evaluations of state and federal regulatory requirements to provide input about improvements or request streamlining processes; 2) monitoring overall progress toward achieving the state's standards for decreasing flood vulnerability in the basin; 3) reviewing and identifying local policies and regional projects that would effectively achieve state standards as well as current actions or practices that hinder the program in achieving related objectives; 4) discussing proposed developments in local jurisdictions to determine regional impacts on flood vulnerability; and 5) beginning the process of devising alternatives for a basinwide cumulative development impact

assessment process or model; and 6) developing a basinwide hazard mitigation plan and completing subsequent updates per federal/state timelines.

The "technical committee" is critical to the success of the TRB Program since one of the key benefits of the program is the sharing of information, expertise and staff to increase the overall cost-effectiveness of hazard mitigation efforts. The primary role of the technical committee is to work with the policy committee in determining what information is needed to fulfill the policy committee's responsibilities described above as well as the overall program mission. The technical committee reports back to the policy committee after working with specific technical subcommittees to collect and analyze data. The reporting process between the technical and policy committees is intended to expose the policy committee to existing basin information as well as provide an opportunity for local staff and experts to recommend local policy changes and generate ideas for regional projects.

Both the policy and technical committees would work closely with the "grants committee." Specifically, the policy committee will inform the grants committee of the projects—regional and local—that member governments agreed upon for further planning or implementation. The grants committee would rely on the technical committee, during the development of the grant application, for detailed information about the potential project, related agency programs or regulatory concerns and existing examples of the proposed project both inside and outside the basin. The grants and technical committees as well as the technical or issue-specific subcommittees will comprise staff from state and local governments as well as identified experts in the field or interested stakeholders in the basin. Actual local staff participation and the level of involvement of each staff member would be determined by the policy committee based on the collaborative identification of appropriate expertise within local agencies—including public works, engineering, emergency

operations and finance—and criteria developed by the policy committee related to local government size and capacity.

B. A Process for Identifying a Regional Institutional Approach for Hazard Mitigation in Other River Basins

The process that was used to identify a regional approach for the Tar River Basin can serve as a starting point for identifying potential regional approaches in other river basins or even toward other planning specializations. The following list is meant to provide a brief summary of lessons learned throughout development of this masters project:

- Compile and spatially analyze existing development management policies throughout the river basin to determine if and where differing levels of effort or priorities exist.
- Review jurisdictions' hazard mitigation plans to obtain information about existing and potential mechanisms for implementing mitigation actions and an assessment of capabilities and commitments within each jurisdiction.
- Gain an understanding of the regulatory environment—local, state, and federal—with impact or linkages to hazard mitigation objectives. In the case of flood hazard mitigation, this means compiling information about all regulatory programs applied to water resources within the basin.
- Conduct as many interviews possible with different representatives of local government including staff, city/county managers and local elected officials to compile information about political feasibility and local perspectives toward implementing a basinwide approach.
- Complete case studies to compare different models and think broadly about the challenges and opportunities existing within the target basin of concern.
- Obtain input related to different regional planning approaches from experts or practitioners in the basin especially staff at COGs and state agencies.
- Consider potential driving forces and "policy entrepreneurs" or champions that may exist in the basin throughout the research process. These factors are critical to the initiation and subsequent success of a regional approach. The final recommendation included in this master's project is limited in that it fails to identify a person(s) who can strategically communicate the need for and benefits of a regional approach to garner support from those whose participation is required.
- Consider an adaptive management approach toward regional policy-making based on commitments from all levels of government and collaborative learning. Such an approach would require an accountability mechanism including externally set standards or objectives, but may provide flexibility as an incentive to local government participation.

C. Research Questions Revisited

The scope and development of this masters project was guided by specific research questions. These questions are answered below to provide clear, concise conclusions about potential opportunities for integrating flood hazard mitigation and watershed planning through regional institutional approaches.

How can flood hazard mitigation be an integral component of land use planning and what is the appropriate geographical scope? Existing land use mechanisms including zoning, subdivision and floodplain management ordinances can serve as effective flood hazard mitigation actions in that these tools can prevent development on the floodplain. However, the negative impacts associated with land use regulations toward property or development hinders actual implementation. Failed implementation related to land use regulations has significant cumulative consequences when thought of in terms of upstream and downstream communities within a common river basin. Local governments must take a broader approach in considering where growth should and should not occur within respective jurisdictions as well as within the larger geographic area. Similarly, broader consideration of different land use tools such as those promoted in watershed protection approaches can help to achieve multiple objectives as well as significant indirect benefits that may increase broad support during implementation.

What is the proper scale of organization necessary to address flood hazard mitigation through land use planning? The scale of the organization should match the scale of the issue; otherwise, an attempt to address the issue or solve the problem is no different than a "band-aid" approach. In the case of flood hazard mitigation, the efforts of downstream communities to reduce flood hazard vulnerability may be negated with development on floodplains upstream. However, a basinwide approach toward floodplain management would not be completely effective either given the impact of increased impervious surfaces throughout the basin including the headwaters of local

subwatersheds. The proper scale of organization would be one that is able to decide at the basin-level where growth should and should not occur. As one COG in the Tar Rive Basin begins meetings with member governments, "remember, you are a region" and not just individual jurisdictions participating in a regional planning process.

What type of organizational structure would be required? How should policies and programs be created and implemented? A special purpose regional agency created through state legislation would be needed to implement a basinwide approach for flood hazard mitigation. The policy-making board of the agency would be comprised of representatives from each jurisdiction to provide member governments with ownership of the process. Accountability of its members would, therefore, need to be established through some other body. The state can play the dual role of partnering with the basinwide organization by providing staff support and technical assistance while also setting basin-level standards in which the program must achieve. In the case of flood hazard mitigation, the arrangement must be allowed to begin slowly and evolve over time; the legislation should be flexible to allow the organizational structure and the powers it is provided to adapt based on mutually beneficial agreements between local governments as well as with state and federal agencies. Starting slow may also help sell the idea to both state and local representatives and allow these participants to realize the benefits of an interorganizational network with common objectives.

How would federal and state agencies provide advisory services, technical assistance and grants to support a new institutional approach for hazard mitigation? How would federal/state agencies interact with the new regional organizational structure? Regulatory streamlining must be a part of any process that attempts to solve complex problems or involve multiple levels of government. The ability of state and federal government to offer this to local governments participating in a regional arrangement is one "carrot" that can accompany the "stick." In the case of flood hazard mitigation and other water resources related issues, state agencies must

transform from regulators to partners to effectively support a newly formed regional program and provide the necessary staff and technical assistance. Both state and federal grant programs need to change grant eligibility requirements to enable regional agencies to apply and receive grant monies. The federal government must also change the criteria in which it approves plans and administers regulatory requirements to promote regional approaches and recognize those local governments that go above and beyond minimum requirements.

REFERENCES

Ablemarle-Pamlico National Estuary Program Website. http://www.apnep.org/pages/regions.html. Last accessed April 12, 2005.

American Planning Association. 2003. "The history of regional planning." In Kemp, Roger L., ed. Regional Government Innovations. Jefferson, North Carolina: McFarland and Company, Inc., Publishers, Chapter 1.

American Water Works Association. 2001. "Integrated resource planning." Water resources planning. Manual of practice 50, first edition.

Anacostia Restoration Team, 1991. Watershed restoration handbook, Department of Environmental Programs, Metropolitan Washington Council of Governments.

Armingeon, Neil Alan. 1989. An analysis of coastal growth and development in North Carolina since the enactment of the Coastal Area Management Act. Final report submitted to North Carolina Department of Natural Resources Division of Coastal Management. Durham, North Carolina: Duke University.

Arnold, Joseph L. 1988. The Evolution of the 1936 Flood Control Act. Prepared for the US Army Corps of Engineers' Office of History. Virginia: USACE.

Association of State Floodplain Managers. 2003. No Adverse Impact: a toolkit for common sense floodplain management. Madison, Wisconsin: ASFPM.

Association of State Floodplain Managers. www.floods.org. Last accessed November 24, 2004.

Association of State Floodplain Managers. 2004. No adverse impact floodplain management: community case studies. Madison, Wisconsin: ASFPM.

Beatley, Timothy. 1998. "The vision of sustainable communities." In Raymond J. Burby, Ed. Cooperating with Nature: Confronting Natural Hazards with Land-Use Planning for Sustainable Communities. Washington, DC: Joseph Henry/National Academy Press, Chapter 8.

Brewer, Kimberly, and Clements, J. Trevor. 2002. Principles of watershed management. Last accessed via http://www.epa.gov/watertrain/watershedmgt/ on August 25, 2004. Prepared for the Environmental Protection Agency. Research Triangle Park, NC: EPA.

Brower, David, et al. May 2004. River basin scale planning for flood hazard mitigation in the Tar River Basin of North Carolina: an assessment of development management policy distribution. Prepared for the North Carolina Department of Crime Control and Public Safety Division of Emergency Management. Chapel Hill, North Carolina: UNC Department of City and Regional Planning.

Burby, Raymond J. 1998. " Natural hazards and land use: an introduction." In Raymond J. Burby, Ed. Cooperating with Nature: Confronting Natural Hazards with Land-Use Planning for Sustainable Communities. Washington, DC: Joseph Henry/National Academy Press, Chapter 1.

Burby, Raymond J., et al. 1998. " Policies for sustainable land use." In Raymond J. Burby, Ed. Cooperating with Nature: Confronting Natural Hazards with Land-Use Planning for Sustainable Communities. Washington, DC: Joseph Henry/National Academy Press, Chapter 9.

Burby, Raymond J. April 4, 2005. Email correspondence.

Cayuga Lake Watershed Intermunicipal Organization website. www.cayugawatershed.org. Last accessed April 12, 2005.

Center for Watershed Protection Website. www.cwp.org. Last accessed April 12, 2005.

Center for Watershed Protection. 1998. Rapid watershed planning handbook: a comprehensive guide for managing urbanizing watersheds. Elliot City, Maryland: CWP.

CNN News. www.cnn.com. Last accessed September 24, 2004.

Dewberry and Davis, Inc. May 2004. Flood hazard mitigation and environmental restoration summary report. Prepared for Mecklenburg County Storm Water Services Division.

Deyle, Robert E. July 26, 2004. Email correspondence.

Deyle. Robert E. June 1995. "Integrated water management: contending with garbage can decision-making in organized anarchies." Water Resources Bulletin. Vol. 31, no. 3, p. 387-398.

Eckenrod, Dick. 2001. "Reaching consensus on the Tampa Bay Estuary Program interlocal agreement." In Myrna Mandell, Ed. Getting results through collaboration: networks and network structures for public policy and management. Westport, Connecticut: Quorum Books, 231-238.

Eckenrod, Dick. March, 30, 2005. Phone correspondence.

Environmental Protection Agency. May 2004. Protecting water resources with smart growth, EPA Publication 231-R-04-002. Washington D.C: EPA.

Environmental Protection Agency. Office of Watersheds, Oceans and Wetlands Website. http://www.epa.gov/owow/ watershed/framework.html. Last accessed April 12, 2005.

Faber, Scott. 1996. On borrowed land: public policies for floodplains. Cambridge, Massachusetts: Lincoln Institute of Land Policy.

Federal Emergency Management Agency. 2002. Community rating system coordinator's manual, OMB No. 3067-0195. Prepared by the National Flood Insurance Program. Washington D.C: FEMA.

Federal Emergency Management Agency. Backgrounder: property acquisition projects (buyouts). Last accessed via http://www.fema.gov/library/buyouts.shtm on August 29, 2004. Washington D.C: FEMA.

Federal Emergency Management Agency. May 25, 2004. Press release: property FEMA awards $3 million grant to remove homes from floodway, press release number: R3-04-045. Last accessed via http://www.fema.gov/news/newsrelease.fema?id=12344 on August 29, 2004. Washington D.C: FEMA.

Federal Emergency Management Agency. November 1, 2000. Rebuilding for a More Sustainable Future: an Operational Framework, FEMA Publication 365. Washington D.C: FEMA.

Federal Emergency Management Agency. June 28, 2004. Repetitive Loss Action Plan, Final Draft. Prepared by the National Flood Insurance Program. Washington D.C: FEMA.

Federal Emergency Management Agency Mapping and Analysis Center. Maps obtained from the UNC Population Center Website. www.cpc.unc.edu/projects/floyd/flood_extent.html. Last accessed April 1, 2005.

Federal Emergency Management Agency Website. www.fema.gov. Last accessed on September 30, 2004.

Gannon, Rich. March 29, 2005. Direct correspondence.

Gibbs, Tim. April 1, 2005. Email correspondence.

Godshalk, David, et al. 1999. Natural hazard mitigation: recasting disaster policy and planning. Washington, D.C.: Island Press, p. 193-229.

Godschalk, David, et al. 1998. " Integrating hazard mitigation and local land use planning." In Raymond J. Burby, Ed. Cooperating with Nature: Confronting Natural Hazards with Land-Use Planning for Sustainable Communities. Washington, DC: Joseph Henry/National Academy Press, Chapter 4.

Hein, William. 1996. Metropolitan Transportation Commission memorandum from the Deputy Executive Director. Written for the MTC Advisory Committee re: MTC's Authority Regarding Transportation and Land Use, November 21.

Hitchings, Benjamin G., Fall 1998, "A typology of regional growth management systems." The Regionalist, Vol. 3. No.1/2: 1-14.

Hitchings, Benjamin G. March 31, 2005. Email correspondence.

APPENDICES

APPENDIX A: EXISTING POLICIES RELATED TO HAZARD MITIGATION AND WATERSHED PLANNING

Due to the causes, constraints and magnitude of the problem previously described, pre-disaster mitigation must be considered a regional land use planning and development management issue. The term "regional" as used in the preceding context translates into a regional plan and subsequent regional action or, at a minimum, local planning with horizontal consistency across local governments. Intergovernmental and interagency efforts such as this are dependent on the commitment and resources devoted by each participating agency as well as vertical support through federal and state mandates and programs. The information presented in the following sections summarizes government regulations, policies and programs that impact the problem of flooding. Included in this summary is an analysis of each policy's impact on the problem as well as an evaluation of effectiveness related to flood damage reduction. The different levels of government—federal, state, and local—organize the discussion of policies that follows.

A. Federal Policies

Descriptions of the most significant federal regulations and programs implemented between 1936 and 2000 illustrate the evolution of federal policy related to floods over time and the role of several key federal agencies in flood damage reduction or mitigation. In reality, there are many federal policies with impacts on flood damage reduction activities in the US. Furthermore, when considered in the larger context of water resources management there are hundreds of distinct water related regulations and programs authorized by legislation and administered by numerous federal agencies (Schad, p. 54). The information contained in this section focuses on three federal agencies—US Army Corps of Engineers, Federal Emergency Management Agency and Natural Resources Conversation Service—to explain the significant structural and nonstructural activities, past and present, with impact on flood hazard mitigation today.

When considered together, federal policies over time resulted in an overall lack of attention to the most critical elements of effective flood hazard mitigation—land use planning and development management throughout a watershed. Despite early recognition about the need to manage water resources at the river basin level and language in original flood acts about the benefits of land use controls, federal policy and related Congressional appropriations focused on large scale structural projects or disaster relief. The long-term impacts of our federal policies proved costly—socially, environmentally and economically.

Legislation intended to "protect" people and property from "destructive floods" began with the **Flood Control Acts of 1928 and 1936**. The purpose of these Acts was to control floods on the Mississippi River and, subsequently, throughout the entire Nation. In particular, the 1936 Act created a large role for the US Army Corps of Engineers (USACE) authorized to construct various projects for improvements to rivers and harbors of the United States, and for other purposes (i.e., development of hydroelectric power, establishment of parks and recreation areas, and fish and wildlife protection) (Arnold, p. 93). The 1936 Act authorized 218 new flood control projects consisting of reservoirs, dams, floodwalls, and levees and appropriated $320 million for "carrying out improvements herein and…any examinations and surveys provided for in the Act," (Arnold, p. 100). However, William Hoyt and Walter Langbein suggested in their 1955 book, *Floods*, that actual expenditures were on the order of $152 million by the USDA and $3 billion by USACE. Costs for the same level of flood control at that time were tripling (Riley, p. 220).

More significantly, these structures did not guarantee complete protection from floods as thought. Structural projects designed to protect people and property actually worsened the problem; several government studies completed after the Mississippi River flood in 1993 highlighted the presence of a cycle related to flood damages in society. The cycle begins with a flood event and related losses; these events are followed up with disaster relief, implementation of a flood-control

project which attempts to store, accelerate, block, or divert floodwaters in the future (Riley, p. 223). Federal actions created a false sense of security while continuous encroachment in the floodplain and development in the watershed increased vulnerability to future flooding.

In 1942, Gilbert White offered an alternative approach to flood control—floodplain management or public policies implemented to reduce the impact of floods on people and property within a community. These public policy options included measures such as land use planning and regulation, land acquisition, flood predictions and warning, and flood insurance (Platt and Rubin, p. 75). However, land use regulations were seldom used to limit new development in areas of flood risk during the 1940's, 50's and 60's; floodplain management still remains controversial today, (Platt, 1999, p.6). Despite nationwide recognition of the costs and failures of structural projects and a change in federal terminology from "flood control" to "flood damage reduction," the federal government continued to spend huge sums to store, divert and channelize floodwaters and upgrade aging structures.

The federal government did, however, implement the **Federal Disaster Relief Act of 1950** in response to failed structural projects. This Act would serve as the foundation for several subsequent acts that forever changed the federal government's disinterest in the direct personal and economic welfare of flood victims into limited federal involvement. As a result, the federal government committed billions of dollars over the next half of century in relief funds directly to individuals and communities impacted by a disaster event (Platt, 1999, p. 12). The original Act was limited to events for which "the situation is of such severity and magnitude that effective response is beyond the capabilities of the State and of the affected local governments," (May and Williams, p. 7). However, over the course of the next 25 years this Act would be amended several times following specific crises and so extensively that the federal government today provides relief funds for reconstruction of public facilities, grants to individuals for emergency needs, unemployment

assistance and mental health care, and low-interest loans to businesses, individuals with properties and farmers in disaster-struck areas (May and Williams, p. 7-8). Different federal agencies and departments managed the Act before finally being transferred to FEMA in 1979.

The costs of disaster assistance provided throughout the county increased dramatically; the 1950 appropriation was $5 million compared to $10 billion provided to states in 1994 (Platt, 1999, p. 15-16). Revisions of the Act and the subsequent implementation of the **Stafford Disaster Relief and Emergency Assistance Act** in 1988 attempted to address the huge costs for the federal government after a disaster declaration. In addition, many recognized that funds were not being used to supplement exhausted state and local funds; rather the disaster relief process lacked a review or evaluation element to ensure that disaster relief was indeed supplementing existing state and local funds. The Stafford Act maintained broad language and prohibited the use of a set formula or sliding scale to deny relief funds to any area in the country but it required geographic areas struck by disasters to evaluate mitigation opportunities as part of receiving disaster funds (Platt, 1998, p. 48).

It was not until the **National Flood Insurance Act of 1967** that the federal government would promote nonstructural flood damage reduction measures nationwide. The Act created the National Flood Insurance Program, which offers three key components: 1) flood insurance for individual property owners; 2) floodplain mapping for communities; 3) and a requirement that participating communities implement floodplain management regulations or ordinances. The **Disaster Protection Act of 1973**, which made participation in the NFIP mandatory in order to receive disaster and other federal assistance, strengthened the NFIP. However, participation in the NFIP was a "hard sell" and remained low in the many communities across the county identified as located within flood hazard areas. In sum, the NFIP is blamed for creating a dependency on the federal government among property owners much in the same way as disaster relief policies did among state and local government. The federal government subsidizes people to live in hazardous

areas and then bails these people out when a disaster occurs. Furthermore, the NFIP prevents the implementation of effective land use planning in these communities by creating a false sense of precaution and security.

FEMA's Mitigation Division, today, is actively implementing the revised Stafford Act, also known as the **Disaster Management Act of 2000** (DMA2000). This act requires all states and localities to have a FEMA approved hazard mitigation plan in order to receive federal disaster assistance following a disaster event. FEMA provides technical assistance to the states and localities in the form of manuals and training and regional offices work closely with state emergency management agencies during the review and final approval processes. At the time of writing, the deadline for state and local hazard mitigation plans— November 1, 2004—was fast approaching.

Although it is too soon to know the full impacts of DMA2000, it proved a difficult rule to follow. Many states and localities did not receive the criteria or rule requirements until 2002 because it was yet to be finalized and still remains as an interim rule. In addition, there exists a wide gap in local capacity and resources to develop an all hazard mitigation plan in which FEMA requires multiple different elements (i.e., vulnerability assessment, risk profile, monitoring, update, etc.). For this reason, the responsibility of developing the hazard mitigation plan ranged from planning departments to emergency management offices to fire chiefs across different municipalities. Similarly, a disparity exists between states and localities that previously experienced and planned for specific hazards and others that have not. Basically, DMA2000 requirements treats all states and localities the same by requiring a standardized set of planning elements while it fails to recognize states and localities with strong hazard mitigation efforts already existing.

FEMA also administers several grant programs intended to assist state and local governments with hazard mitigation planning and implementation of mitigation actions. There are three key grant programs in terms of mitigating flood damages: the **Hazard Mitigation Grant**

Program (HMGP), **Flood Mitigation Assistance Program** (FMA), and **Pre-Disaster Mitigation Program** (PDM). Recent changes to the above grant programs including the creation of PDM, the first competitive grant program to provide money to states for local mitigation planning and projects without waiting for a disaster to first occur, are illustrative of the current President's administration lack of attention to mitigation in light of the administration's identified high priorities such as technological disasters and the reorganization of FEMA under an umbrella organization, the Department of Homeland Security (DHS). A large portion of FEMA's annual budget was shifted to DHS for the purposes of reorganizing, in part, resulting in a staffing shortage within the Mitigation Division. Similarly, HMGP funds were reduced from 15 to 7.5 percent of total disaster grants awarded by FEMA (www.fema.gov). PDM was implemented to supplement the reduction in HMGP funds but the competitive application process results in political conflicts especially at the state level during the decision process and favors local jurisdictions with experience in writing proposals.

The NFIP manages the **Community Rating System** (CRS), an incentive based program that allows communities to obtain lower insurance premiums if mitigation planning goes beyond the minimum requirements of the NFIP. CRS provides points that equal premium reductions for certain community actions such as open space preservation, particularly where natural functions are protected; higher regulatory standards that protect floodplain storage capacity and establish land development criteria; stormwater management plans that consider future urbanization in a watershed; and use of additional data that also consider future conditions and more restrictive floodway standards (FEMA, 2002).[1]

[1] FEMA's *Project Impact: Building Disaster-Resistant Communities* was an initiative that challenged and supported communities to become disaster and, specifically, to undertake actions that protect families, businesses and communities by reducing the effects of natural disasters. Unfortunately, the initiative was short-lived; it began in 1998 and was discontinued by the Bush Administration in 2000. *Project Impact* is cited as having promoted an interdisciplinary approach to hazard mitigation that was "innovative, performance based and utilized techniques that

With an even greater emphasis on flood damage prevention at the watershed scale than the CRS, the US Department of Agriculture's Natural Resource Conservation Service (USDA NRCS) administers two programs that could serve as models to promote similar policies in the future and counteract piecemeal mitigation planning resulting from previous federal policies. The first NRCS program, **Watershed Protection and Flood Prevention** or Public Law 83-566, provides technical and financial assistance to "protect, develop and utilize" water and land resources within watersheds under 250,000 acres in size. This assistance is provided directly to local people and organizations through project sponsors, partnerships, multi-disciplinary planning and local and state funding contribution. The Office of Management and Budget suggests that this program is unique in that it promotes the application of conservation land treatment on upstream watersheds to achieve multiple objectives including watershed protection, flood prevention, and agricultural/ nonagricultural water management (p. 81).

As a result of the Farm Bill of 1996, USDA's Natural Resources Conservation Service offers the **Emergency Watershed Protection Program**, which provides "technical and financial assistance to local sponsors for the relief of imminent hazard and reduction of the threat to life and property." Although the geographical area does not have to be declared a federal disaster area, EWP refers to its activities as "emergency work" that includes establishing quick vegetative cover on denuded or sloping land and eroding banks, opening dangerously restricted channels and other structural repairs. However, the program is also authorized to purchase floodplain easements as an emergency measure (Office of Management and Budget, p. 33). However, the descriptions of both NRCS programs as well as CRS suggest that the implementation of these programs typically follow

could be institutionalized for the next generation," (Natural Hazards Center). The grant was not to undertake specific mitigation projects but to build capacity and support for various projects; as a result, hazard mitigation was community-based and supported by a broad network of stakeholders and participatory decisionmaking.

experiences with disaster events and offer little incentive to employ mitigation planning in those communities where a disaster has yet to occur.

B. State Policies

State governments largely follow the federal government's regulatory and grant programs in terms of policy making at the state level. Flood damage reduction policies, particularly at the state level are very much crisis-driven. After a flood event, a window of opportunity, characterized by heightened public awareness and governmental recognition of the problem, opens. Several different factors determine how long the window remains open but the window can enable dialogue and commitments from all levels of government and the public to fix or mitigate a problem where previously lacking. There is also the rare opportunity to assess the characteristics of the flood event including the geographical scope and context and resulting damages that occurred to plan accordingly for the future. Combining this window of opportunity with innovation leads to progressive and effective policy making at the state level; this formula was used by the State of North Carolina to become one of the leading states regarding flood hazard mitigation. Different hazard policies exist in each state; for the purposes of this research, a description of the policies of North Carolina's state government and an evaluation of effectiveness related to flood damage reduction are included.

The North Carolina Division of Emergency Management (NCDEM) first implemented the **Hazard Mitigation Planning Initiative** (HMPI) after Hurricane Fran in 1996; HMPI is a model of a state initiative that attempts to address all hazards before they occur. The State cites multiple objectives behind the implementation of the HMPI: 1) promote the development of local hazard mitigation plans; 2) incorporate hazard mitigation principles into daily activities as well as decision-making processes; 3) decrease vulnerability to future disasters; and 4) increase communities'

eligibility for pre-disaster and post-disaster mitigation funding as determined by the federal government (North Carolina Division of Emergency Management, p. 31).

Initially, HMPI included 11 "demonstration communities;" designation as a demonstration community involved an agreement with NCDEM to complete a local all hazard mitigation plan within an 18-month time period and allow use of completed plans by other communities seeking to implement mitigation strategies. HMPI preceded DMA2000 requirements and put in place a hazard mitigation ethic and template for communities in the State to use; as a result, the State demonstrated to FEMA its capability and expertise in developing hazard mitigation plans. The DMA2000 requirements related to plan contents issued years later were very similar to the minimum criteria required for HMPI local plans. As of May 2001, an additional 45 communities joined the HMPI after receiving HMGP and FMA grants from FEMA (North Carolina Division of Emergency Management, p. 70).

Similarly, North Carolina's **Coastal Areas Management Act of 1974** was the first of its kind in the US; the Act is administered by the Division of Coastal Management but enables the North Carolina Coastal Resource Commission (CRC) with extensive regional authority. First, the Act requires the CRC to designate areas of environmental concern (AEC), both on land and in water, to protect environmentally fragile or important areas from incompatible development. The Act then provides the CRC with authority to regulate development through permitting processes in AECs. The CRC is also responsible for establishing minimum construction guidelines, including prohibitions of certain types of development and minimum setbacks, for implementation across the twenty counties comprising the coast of North Carolina. Finally, the Act requires each of the twenty counties to develop a land use plan for integration into one North Carolina Coastal Management Plan. The CRC reviews each land use plan for compliance with CAMA and decides final plan approvals for implementation at the local level and integration at the state level.

As of 2001, the CRC added new planning requirements specific to hazard mitigation including land suitability as an integral factor for land use planning. Land use plans now must contain mapping and an analysis of areas subject to flooding and related development limitations presented by areas subject to recurring flooding. Plans must also include an estimation of public and private flood damage since the last plan update, which are required every five years (North Carolina Division of Emergency Management, p. 105).

The hurricane events and flooding experienced in the late 1990's highlighted a significant flaw in hazard mitigation in the State as well as the rest of the country. The Flood Insurance Rate Maps (FIRMs) developed by FEMA and used to identify the floodplains were outdated and inaccurate as a result. Meckelenburg County, in light of its extensive growth and development, began the process of updating floodplain information for the County's maps in 1997 (Charlotte-Mecklenburg Stormwater Services, p. 1-2). Three years later, the State of North Carolina was designated the first **Cooperating Technical State** in FEMA's **Map Modernization Project**. Along with ten other Cooperating Technical Partners (CTP) and seven state and community partners, the statewide program will conduct flood hazard analyses and produce updated, digital FIRMs for North Carolina's river basins (North Carolina Division of Emergency Management, p. 10).

NCDEM describes the final product and its benefits to the community as providing "accurate information for North Carolina communities and property owners to make sound siting and design decisions when rebuilding after flooding disasters, when building new structures and infrastructure, and when retrofitting existing structures," (North Carolina Division of Emergency Management, p. 10-11). As part of its effort, the State has allocated $25 million to complete Phase I or the mapping of six of its eastern river basins; FEMA has increased these funds by adding $5.25 million. However, the full costs of the statewide program are estimated at $65 million and the State

is actively working with the CTPs to secure additional funding for subsequent phases of the project (North Carolina Division of Emergency Management, p. 11).

Since 1986, the state of North Carolina recognized the need to protect the sources of the state's water supplies through limits on the number and type of wastewater discharges allowed in watersheds. The Division of Water Quality administered standards and implemented a voluntarily program among local governments that adopted and enforced land use control ordinances to protect surface waters from nonpoint pollution sources, including stormwater runoff. In 1992, the state formally adopted the **Watershed Supply Watershed Protection Rules** requiring all local governments having land use jurisdiction within water supply watersheds to adopt and implement water supply watershed protection ordinances, maps, and a management plan. The Rules allow local governments to adopt an ordinance under general adoption powers; however, "the language contained in the model ordinance provided by the state is useful for local governments adopting their ordinances as zoning overlay districts and also for local governments implementing the Rules by amending their subdivision regulation," (http://h2o.enr.state.nc.us/wswp).

North Carolina's Clean Water Management Trust Fund (CWMTF) is another example of a program implemented to reach specific objectives, reduce water pollution and improve the State's water quality, and then broadened to achieve other high priority objectives within the State. In 1999, the CWTMP approved $5.7 million in grants to the North Carolina Division of Environment and Natural Resources (DENR) for the Floodplain Management program. This program was specifically intended to provide incentives to hog and livestock farm owners to move operations out of the floodplain; at the time, the amount of hog waste washed from lagoons in the floodplains was a huge problem for the State after a flood event. Since 1999, the Floodplain Management program has evolved to include funding for the relocation of other agricultural and industrial operations out of the floodplain, restoration and preservation of riparian buffers in

floodplains, stormwater treatment and control projects, streambank restoration, restoration and creation of wetlands and open space preservation all with the stated purpose of reducing future flood damages. As of 2001, these projects resulted in the awarding of over $21 million and clearly links water quality goals with flood concerns (North Carolina Division of Emergency Management, p. 17-18).

The federal government has recognized North Carolina as a leader in hazard mitigation for its initiatives described above and its efforts to improve coordination among state agencies and local communities through the State Hazard Mitigation and Long Term Recovery Advisory Group. In addition, North Carolina's NFIP communities achieved some of the highest CRS scores in the country. As a result, North Carolina was the first state to be granted Managing State status, which enables NCDEM with authority to approve many aspects of HMGP and FMA grant applications before final approval from FEMA. Managing State status greatly expedites the process of receiving grant monies for many North Carolina communities. One example provided by NCDEM occurred immediately after Hurricane Floyd struck when all 4,200 of the buyout project applications were approved over the course of the next year (p. 28).

Given historic records and the continued risk of flood events, North Carolina recognizes that it cannot end its efforts to achieve flood hazard mitigation with the above successes. NCDEM highlights that State initiatives are lacking in river basin approaches, which would serve as ideal delineations of geographical planning areas for the State in light of its overall diverse topographic and climatic conditions.[2] Furthermore, the State's successful coordination efforts must be expanded to local communities to address future growth and development. The State has recognized the link between its vulnerability to natural hazards and rapid growth experienced in its urban areas particularly during the 1990's (www.ncsmartgrowth.org). NCDEM suggests the implications of this

[2] North Carolina comprises seventeen major river basins ranging in size from over 9,000 square miles to barely 150 miles (North Carolina Division of Emergency Management, p. 4).

type of growth are expanded development in flood prone areas and a reduction of natural buffers that serve to mitigate the impacts of flooding (p. 9). Overall increased impervious surfaces at the watershed level and increases in stormwater runoff due to new development and sprawl may result in additional increases in flood damage. The State's Smart Growth Commission, asked to conduct a study of growth management in the State, made recommendations to the General Assembly that expand upon localities' ability to manage growth and development. The next section of this paper describes current local capability to regulate land use and mitigate hazards.

C. Local Policies

The State of North Carolina is a Dillon Rule state; this means that local governments can only exercise those powers granted by state enabling legislation. In the case of protecting the general health, safety and welfare of citizens, local governments are enabled with the powers of regulation, taxation, spending and acquisition. Therefore, it is at this level of government where hazard mitigation activities can actually be mandated; NCDEM suggests that local government has "a wide degree of latitude" to implement mitigation programs, policies and actions (p. 140). In general, the local government tools below apply to all localities in the state and focus on land use regulations since directly linked to effective and feasible hazard mitigation.

Zoning is the traditional approach for controlling land use; studies of zoning's impact overtime have not been favorable due to the proliferation of cookie-cutter developments and sprawl. However, it remains a well-established tool among local government in that it provides formula like models for identifying minimum specifications (i.e., setback, density, building height, etc.) for developable lots of land. The process of creating a zoning ordinance entails dividing up a local jurisdiction into districts for which different minimum specifications apply. Districts may include general use districts, special or conditional use districts or overlay districts. An example of an overlay district is s flood overlay district, which prohibits otherwise permitted uses because the

proposed development is deemed incompatible with the limitations of the site posed by flood hazards.

Specifically, the North Carolina General Statutes empowers local governments to grant permits for uses to be permitted in floodways; in this way, the legislature sought to control and minimize the extent of floods by minimizing obstructions in the flood channel and a portion of the floodplain. Permits are not required for every use (i.e., agriculture, golf courses, parking areas, etc.) but the process of reviewing and approving permits requires local government to consider the impact on floodwaters and downstream communities of the proposed obstruction as well as "anticipated development in the foreseeable future" (North Carolina Division of Emergency Management, p. 142).

Subdivision regulations control the way in which land is divided into two or more parcels for development or sales purposes. These regulations allow local government to establish minimum requirements including internal improvements (i.e., utility connections, dedication of roads, provision of recreation facilities, etc.) for approval of a new subdivision. The North Carolina General Statute, by granting municipalities the authority to exercise broad subdivision controls, allows for the implementation of local flood-related subdivision regulations. Specifically, these controls can require builders to design water and sewer systems to minimize flood damage and contamination and install adequate drainage facilities. Subdivision controls can prohibit the subdivision of land that is subject to flooding (i.e., the floodplain) unless the flood hazard can be mitigated by filling or other measures. Similar to floodway regulations, subdivision controls prohibit the filling of the floodway (North Carolina Division of Emergency Management, p. 143).

APPENDIX B: EVALUTION OF PROPOSED HAZARD MITIGATION ALTERNATIVES

A. Recommendations of the Interagency Floodplain Management Review Committee (Taken from *Sharing the Challenges)*

Recommendations	Geographical Scope (i.e., Watershed)	Intergovern-mental Collaboration	Cost-effective	Stakeholder Involvement	Legally Feasible	Politically Acceptable	Land Use & Devt Authority
Organize for Success							
Propose enactment of a Floodplain Management Act to provide a national model. (US President)	Possibly	Yes	Yes	No	Yes	No	Possibly
Issue a revised Executive Order clearly defining the responsibility of federal agencies to exercise sound judgment in floodplain management activities. (US President)	Possibly	Yes	Yes	No	Yes	No	No
Activate the Water Resources Council to coordinate federal and intergovernmental activities. (US President)	Yes	Yes	Yes	No	Yes	No	Possibly
Focus Attention on Comprehensive Evaluation of All Federal Water Project and Program Effects							
Establish environmental quality and national economic development as co-equal objectives under the *Principles and Guidelines*. (US President)	Possibly	Yes	Possibly	No	Yes	No	No
Enhance Coordination of Project Development and Introduce Multi-Objective Planning							
Support collaborative efforts among federal agencies and across state, tribal and local governments. (The Administration)	No	Yes	Yes	No	Yes	No	No
Ensure Continuing Interest in Floodplain Management Success							
Provide for federal, state, tribal and/or local cost-sharing in pre-disaster, recovery, response and mitigation activities. (The Administration)	No	Yes	Possibly	No	Yes	Possibly	No
Coordinate the Multiple Federal Watershed Programs							
Establish an Interagency Task Force to develop a coordination strategy to guide watershed management actions. (The Administration)	Yes	Yes	Yes	No	Yes	No	No
Take Full Advantage of Existing Federal Floodplain Management Programs							
Seek legislative authority to increase post-disaster flexibility in the execution of the land acquisition programs. (The Administration)	Possibly	Yes	No	Yes	Yes	Yes	Yes

Recommendations	Geographical Scope (i.e., Watershed)	Intergovern-mental Collaboration	Cost-effective	Stakeholder Involvement	Legally Feasible	Politically Acceptable	Land Use & Devt Authority
Increase environmental attention in federal operation and maintenance and disaster recovery activities. (The Administration)	Possibly	Yes	Yes	No	Yes	No	No
Better coordinate the environmentally related land interest acquisition activities of the federal government. (The Administration)	Possibly	Yes	Yes	No	Yes	No	No
Fund, through existing authorities, programmatic acquisition of needed lands from willing sellers. (The Administration)	Possibly	Yes	Yes	Yes	Yes	Yes	Yes
Enhance the NFIP							
Take vigorous steps to improve the marketing of flood insurance, enforce lender compliance rules, and seek state support of insurance marketing. (The Administration)	No	No	No	Yes	Yes	Yes	No
Reduce the amount of post-disaster support to those who were eligible to buy insurance but did not to the level needed to provide for immediate health, safety and welfare…(The Administration)	No	No	Yes	No	Yes	No	No
Reduce repetitive loss outlays by adding a surcharge to flood insurance policies following each claim under a policy, providing for mitigation insurance riders and supporting for other mitigation activities. (The Administration)	No	No	Yes	No	Yes	No	No
Require those who are behind levees that provide protection against less than the standard project flood discharge to purchase actuarially based insurance. (The Administration)	No	No	Yes	No	Yes	No	No
Increase the waiting period for activation of flood insurance policies from 5 to 15 days to avoid purchases when flooding is imminent. (The Administration)	No	No	Yes	No	Yes	No	No
Leverage technology to improve the timeliness, coverage, and accuracy of flood insurance maps. (The Administration)	Possibly	Yes	Yes	No	Yes	Yes	No
Provide for the purchase of mitigation insurance to cover the cost of elevating, demolishing or relocating substantially damaged buildings. (The Administration)	No	No	Yes	No	Yes	Yes	Possibly
Reduce Vulnerability to Flood Damages of Those in the Floodplain							
Give full consideration to all possible alternatives for vulnerability reduction, including permanent evacuation of floodprone areas, flood warning, floodproofing of structures remaining in the floodplain, etc. (The	Possibly	Yes	Yes	No	Yes	Yes	Possibly

Recommendations	Geographical Scope (i.e., Watershed)	Intergovern-mental Collaboration	Cost-effective	Stakeholder Involvement	Legally Feasible	Politically Acceptable	Land Use & Devt Authority
Administration)							
Adopt flood damage reduction guidelines based on a revised *Principles and Guidelines* which would give full weight to social, economic, and environmental values. (The Administration)	Possibly	Yes	Yes	No	Yes	Yes	No
Where appropriate, reduce the vulnerability of population centers and critical infrastructure to the standard project flood discharge through use of floodplain management activities and programs. (The Administration)	Possibly	Yes	Yes	No	Yes	Yes	Possibly
Ensure Existing Federally Constructed Water Resources Projects Continue to Meet Intended Purposes							
Require periodic review of completed projects. (The Administration)	Possibly	Yes	Yes	No	Yes	No	No
Provide for Efficiency in Operations and Consistency of Standards							
Assign principal responsibility for repair, rehab and construction of levees to the USACE. (The Administration)	Possibly	No	No	No	Yes	Yes	No
Ensure proper siting, construction, and maintenance of non-federal levees. (States and Tribes)	Possibly	Possibly	Yes	No	Yes	Possibly	Possibly
Capitalize on Emergency Management Successes at All Levels of Government and Streamline Future Efforts							
Encourage states and communities to develop and implement floodplain management and hazard mitigation plans through the NFIP's CRS. (The Administration)	Possibly	Yes	Yes	Yes	Yes	Yes	Yes
Provide funding for programmatic buyouts of structures at risk in the floodplain. (The Administration)	Possibly	Yes	Yes	Yes	Yes	Yes	Yes
Provide states the option of receiving Section 404 Hazard Mitigation Grants as block grants. (The Administration)	Possibly	Yes	Possibly	Possibly	Yes	Yes	Possibly
Assign the Director of the FEMA responsibility for integrating federal disaster response and recovery operations. (The Administration)	Possibly	No	Yes	No	Yes	No	No
Encourage federal agencies to use non-disaster funding to support hazard mitigation activities on a routine basis. (The Administration)	No	Yes	Yes	No	Yes	No	No
Provide Integrated, Hydrologic, Hydraulic, and Ecosystems Management of the Upper Mississippi River							
Establish upper Mississippi River Basin and Missouri River Basin commissions to deal with basin-level program coordination. (The Administration)	Yes	Yes	Yes	Possibly	Yes	Possibly	Possibly

Recommendations	Geographical Scope (i.e., Watershed)	Intergovern-mental Collaboration	Cost-effective	Stakeholder Involvement	Legally Feasible	Politically Acceptable	Land Use & Devt Authority
Assign responsibility, in consultation with Congress, to the Mississippi River Commission for integrated management of flood damage reduction…(The Administration)	Yes	Yes	Yes	Possibly	Yes	Possibly	Possibly
Seek authorization from the Congress to establish an Upper Mississippi River and Tributaries Project for management of the federal flood damage and navigation activities. (The Administration)	Yes	Yes	Yes	Possibly	Yes	Possibly	Possibly
Establish the upper Mississippi River Basin as additional national cross-agency Ecosystem Management Demonstration Project. (The Administration)	Yes	Yes	Yes	Possibly	Yes	Possibly	Possibly
Charge the Department of Interior with conducting an ecosystem needs analysis of the upper Mississippi River Basin. (The Administration)	Yes	Yes	Yes	Possibly	Yes	Possibly	Possibly
Provide Timely Gathering and Dissemination of Critical Water Resources Management Information							
Establish an information clearinghouse at USGS to provide federal agencies and state and local activities the information already gathered by the federal government during and following the 1993 flood to build on the pioneering nature of this effort. (The Administration)	Possibly	Yes	Yes	No	Yes	Yes	No
Exploit science and technology to support monitoring, analysis, modeling and the development of decision support systems and geographic information systems for floodplain activities. (The Administration)	Possibly	Yes	Yes	No	Yes	Yes	No

B. Recommendations of Academic Researchers in the Hazard Mitigation Field

Recommendations	Geographical Scope (i.e., Watershed)	Intergovern-mental Collaboration	Cost-effective	Stakeholder Involvement	Legally Feasible	Politically Acceptable	Land Use & Devt Authority
Limit the Practice of Subsidizing Risk							
Examine either a sharp reduction or outright repeal of subsidies (i.e., disaster relief, flood insurance, shoreline protection, flood control, and tax write-offs of losses to property located in identified hazard zones) to foster more prudent decisions and support for local risk reduction efforts. (Congress)	No	No	Yes	No	Yes	No	No
Reduce disaster relief through imposition of thresholds of loss that better reflect the ability to recover from loss without federal subsidies (i.e., state and local deductibles, and local deductibles). (Congress)	No	No	Yes	No	Yes	No	No
Even though small, eliminate subsidies to owners of structures built prior to the date their communities entered the NFIP. (Congress)	No	No	Yes	No	Yes	No	No
Implement surcharges to premiums charged repetitive loss properties. (Congress)	No	No	Yes	No	Yes	No	No
End the shoreline erosion subsidy. (Congress)	No	No	Yes	No	Yes	No	No
Ensure the private sector assumes responsibility for the consequences of its actions by reducing the current federal level of financial responsibility for property insurance risks despite pressure from the insurance industry to increase its financial responsibility. (Congress)	No	No	Yes	No	Yes	No	No
Appropriate Congressional funds to acquire land in hazardous areas for public use (and non-use). (Congress)	Possibly	Yes	Yes	No	Yes	Possibly	Yes
Phase out federal appropriations to agencies providing flood control services and require that they operate on a full cost-recovery basis in which state and local government bear any upfront costs. (Congress)	No	No	Yes	No	Yes	No	No
Build a Shared Base of Knowledge							
Provide product type-labeling information that would enable consumers to avoid high hazard areas. (Local government)	No	Yes	Yes	Yes	Yes	No	No
Expand detailed floodplain mapping to more communities and make maps more reliable. (Congress, FEMA and state government)	Yes	Yes	Yes	No	Yes	Possibly	No
Extend flood hazard mapping to watersheds of less than one square mile and formulate floodplain maps that take into account not only existing	Yes	Yes	Yes	No	Yes	Possibly	No

Recommendations	Geographical Scope (i.e., Watershed)	Intergovern-mental Collaboration	Cost-effective	Stakeholder Involvement	Legally Feasible	Politically Acceptable	Land Use & Devt Authority
development but also future development that increases peak discharges from watersheds. (Congress, FEMA, state and local government)							
Ensure that information is available to and understood by the public and consider underwriting public awareness campaigns. (Congress, FEMA and state government)	Possibly	Yes	Yes	Yes	Yes	Yes	No
Share knowledge with the various professional groups in and outside government that deal with daily decisions that affect exposure to hazards and target specific professionals for training materials and courses. (FEMA, state and local government)	Possibly	Yes	Yes	Yes	Yes	Yes	No
Diffuse information about retrofitting existing buildings to reduce their vulnerability to various hazards among building trades and do-it-yourself enthusiasts. (FEMA, state and local government)	No	Yes	Yes	Yes	Yes	Yes	Yes
Encourage partnerships between local governments and nongovernmental groups to retrofit homes of the poor and elderly located in hazardous land as open space and natural areas and build overall consensus in the community about hazard mitigation. (Local government)	No	Yes	Yes	Yes	Yes	Yes	Yes
Develop Commitment to Manage Hazardous Areas							
Encourage social learning to increase personal and community responsibility for the consequences of decisions made, enhance knowledge, build understanding of alternative development options and achieve community goals. (FEMA, state and local government)	Possibly	Yes	Yes	Yes	Yes	Yes	No
Mandate planning so that the community utilizes unique local circumstances before development pressures mount and to take advantage of federal incentive programs such as CRS. (Congress, FEMA, and state government)	Possibly	Yes	Yes	Yes	Yes	No	Yes
Tie federal and state aid for infrastructure to community participation in land use planning processes since natural hazards, if ignored, has the potential to wreck these investments. (Congress, FEMA, state and local government)	Possibly	Yes	Yes	Yes	Yes	No	Yes
Target recalcitrant local governments for particularly close attention in monitoring their compliance with the requirements of a variety of other federal and state assistance programs. (FEMA and state government)	Possibly	Yes	Yes	Yes	Yes	No	Yes
Encourage the insurance industry to become advocate for sustainable development. (FEMA)	No	No	Yes	No	Yes	No	No

Recommendations	Geographical Scope (i.e., Watershed)	Intergovern-mental Collaboration	Cost-effective	Stakeholder Involvement	Legally Feasible	Politically Acceptable	Land Use & Devt Authority
Coordinate and Integrate Hazard Policies							
Establish an interagency task force to develop a coordination strategy to guide the actions of the federal agencies. (US President)	Possibly	Yes	Yes	No	Yes	No	No
Develop a coordinated strategy at state and local levels, where property is actually exposed to hazards and the impacts of natural disasters are felt first and most severely. (Congress, FEMA, state and local government)	Possibly	Yes	Yes	Possibly	Yes	No	Yes
Consider land use planning as the coordinating mechanism so that federal agencies are required to act in ways consistent with state and local plans and minimize overall policy fragmentation. (Congress, FEMA and other federal agencies, state and local government)	Possibly	Yes	Yes	Possibly	Yes	No	Yes
Foster Innovation in Governance and Land Management							
Foster systematic, collaborative planning processes at the state and local levels rather than promulgate vast new public investment programs to control natural hazards or attempt direct regulation of the use of hazardous areas. (State and local government)	Possibly	Yes	Yes	Possibly	Yes	No	Yes
Encourage all levels of government to define for themselves the meaning of sustainability and the ways in which it can be accomplished. (Congress, FEMA and other federal agencies, state and local government)	Possibly	Yes	Yes	Possibly	Yes	No	Possibly

C. Recommendations of the Association of State Floodplain Managers (Based on the No Adverse Impact Approach)

Recommendations	Geographical Scope (i.e., Watershed)	Intergovern-mental Collaboration	Cost-effective	Stakeholder Involvement	Legally Feasible	Politically Acceptable	Land Use & Devt Authority
Improve Hazard Identification and Floodplain Mapping							
Prepare flood studies using future conditions hydrology. (Congress, FEMA, state and local government)	Yes	Yes	Yes	No	Yes	No	No
Put in place plans and regulations that prevent future flood discharges. (State and local government)	Yes	Yes	Yes	No	Yes	No	Yes
Require floodway delineation be based on preventing a loss of storage and/or increase velocity. (Congress, FEMA, state and local government)	Yes	Yes	Yes	No	Yes	No	No
Define an additional hazard zone, coastal A zone, to differentiate between coastal and non-coastal A zones and ensure buildings in the coastal A zone are designed and constructed to be more resistant to coastal flood forces. (Congress, FEMA, state and local government)	No	Yes	Yes	No	Yes	No	Yes
Seek status as a Cooperating Technical Partner to more quickly update flood maps with data and conduct studies that vary from the standard techniques through the cost-sharing mechanism. (Congress, FEMA, state and local government)	Yes	Yes	Yes	No	Yes	Possibly	No
Expand Education and Outreach							
Train and educate staff on NAI to make them aware of flood hazards and protection alternatives and change attitudes and behaviors in ways that can then be promoted among local officials and in the community. (Local government)	Yes	Yes	Yes	Yes	Yes	Yes	No
Encourage participation in the Certified Floodplain Manager Program to ensure that floodplain management staff are trained and keep up their skills through continuing education related to flood loss reduction, NFIP and other flood programs. (Local government)	Yes	Yes	Yes	No	Yes	Yes	No
Promote environmental and safety education to teach children about flooding, the forces of nature, the factors that cause problems, and the significance of protecting the natural and beneficial functions of watersheds and floodplains. (Local government)	Yes	Yes	Yes	Yes	Yes	Yes	No

Recommendations	Geographical Scope (i.e., Watershed)	Intergovern-mental Collaboration	Cost-effective	Stakeholder Involvement	Legally Feasible	Politically Acceptable	Land Use & Devt Authority
Enhance Local Planning							
Identify all the impacts of the hazard and all of the alternative measures to address the impacts; include consideration of "what happens" and "who really pays" to be aware of all the ramifications in planning and decision-making processes. (State and local government)	Possibly	Yes	Yes	Yes	Yes	No	Possibly
Promote multi-objective management in which public involvement and coordination of floodplain management with other community concerns, such as economic development, housing, water quality, habitat protection and recreation. (Local government)	Possibly	Yes	Yes	Yes	Yes	Yes	Possibly
Use the principles of sustainable development to guide community planning efforts related to floodplain and coastal zone management: (Local government) 1. Maintain and, if possible, enhance, residents' quality of life. 2. Enhance local economic vitality 3. Ensure social and intergenerational equity. 4. Maintain and, if possible, enhance environmental quality. 5. Incorporate disaster resilience and mitigation into daily local and regional land use decision making. 6. Use a consensus-building, participatory process when making decisions.	Yes	Yes	Yes	Yes	Yes	No	Yes
Enhance Watershed Protection Through Regulations							
Preserve beneficial floodplain functions through floodway protection regulations that prohibit development/redevelopment in the floodway and specify in local ordinances or guidelines that the engineering analysis will be done to address the cumulative effect of the proposed development. (State and local government)	Yes	Yes	Yes	Possibly	Yes	No	Yes
Preserve important areas such as the floodplain shoreline with setbacks, buffer zones, coastal vegetative buffers, open space dedication, linear parks and greenways and planned development approaches. (State and local government)	Yes	Yes	Yes	Possibly	Yes	No	Yes
Promote transfers of development rights (TDRs) that allow developers to shift densities so that more units are built in non-floodplain areas and floodplain areas remain as open space forever. (State and local government)	Yes	Yes	Yes	Possibly	Yes	No	Yes

Recommendations	Geographical Scope (i.e., Watershed)	Intergovern-mental Collaboration	Cost-effective	Stakeholder Involvement	Legally Feasible	Politically Acceptable	Land Use & Devt Authority
Protect coastal resources and, specifically, coastal barriers, dunes and beaches, from development to reduce public disaster costs and impacts to both habitat and inland human development. (State and local government)	Yes	Yes	Yes	Possibly	Yes	No	Yes
Protect natural resources by filling in the gaps of federal and state programs with local wetland regulations, stormwater management BMPs, and stream restoration. (Local government)	Yes	Yes	Yes	Possibly	Yes	No	Yes
Improve Existing Mitigation Actions							
Implement master flood protection planning and monitoring to justify the expense/effort associated with implementing actions intended to correct the shortcomings of prior structural and nonstructural measures; integral to master planning is the development of floodplain management, hazard mitigation, watershed and stormwater management plans. (State and local government)	Yes	Yes	Yes	Possibly	Yes	No	Possibly

APPENDIX C: INTERVIEW QUESTIONS

This questionnaire was used during interviews with hazard mitigation planning staff. The same survey was used for interviews with city/county managers and local elected officials except for questions that focus on the specific details of the recent hazard mitigation planning process completed within each jurisdiction.

A. Background

1. What is the status of your jurisdiction's mitigation plan in the FEMA review process?
   - ☐ In progress
   - ☐ Forwarded to FEMA for approval
   - ☐ Approved by FEMA
2. When did the plan development process begin?
3. What is the expected (or was the) date of completion for the plan?
4. Who, as in a department, in your local government was assigned responsibility for preparing the hazard mitigation plan?
5. Which other local government departments/agencies were involved in the plan development process? (Identify all that apply)
   - ☐ Public Works
   - ☐ Planning Department
   - ☐ Fire Department
   - ☐ Other:
6. Which department/agency from above, besides your own, was most involved?
7. Please rank this department/agency's level of involvement compared to your department's involvement:
   - ☐ Much lower level of involvement
   - ☐ Lower level of involvement
   - ☐ Equal level of involvement
   - ☐ Higher level of involvement
   - ☐ Much higher level of involvement
8. Does your jurisdiction participate in the National Flood Insurance Program NFIP?
9. Does your jurisdiction participate in the Community Rating System (CRS)? If yes, what is your jurisdictions current rating?

B. Plan Development

1. What was your jurisdiction's goal in creating a hazard mitigation plan? In other words, why did you initiate the plan development process?
2. If more than one, identify the primary goal:
3. Where did you obtain risk assessment data? (Identify all that apply)

- ☐ In-house
- ☐ Neighboring jurisdictions
- ☐ COG
- ☐ State
- ☐ Other:

4. What was the geographical scope of this data? (Identify all that apply)
   - ☐ Jurisdiction only
   - ☐ Region-wide
   - ☐ State-level
   - ☐ Other:
5. How was risk assessment data used?
6. Were any new insights previously unknown gained through the risk assessment process? If yes, please describe.
7. What was the range of mitigation actions considered during the planning process?
   - ☐ Prevention
   - ☐ Property protection
   - ☐ Public education and awareness
   - ☐ Natural resources protection
   - ☐ Emergency services
   - ☐ Structural projects
   - ☐ Other:
8. If more than one, identify the primary type of mitigation action (i.e., the one most frequently considered/discussed or identified as a high priority for implementation during the hazard mitigation planning process):
9. Was the plan officially adopted within your jurisdiction?
10. If yes, by which entity?
11. Did the adoption process entail on item on the consent agenda, some discussion or a lengthy discussion?
12. Please describe, in your opinion, any results of the adoption process?
13. Who, as in a department, will be responsible for the plan update in five years?
14. Please describe any lessons that were learned during the plan development process. In other words, what should be done differently during the update?
15. Which lesson from above was most significant, in your opinion?
16. Please rank the significance of the above lesson learned related to future local government activities:
    - ☐ Not significant at all

- ☐ Somewhat significant
- ☐ Significant
- ☐ Very significant
- ☐ Don't know

C. Plan Implementation

1. Who is primarily responsible for implementing your jurisdiction's hazard mitigation plan?
   - ☐ City/county manager
   - ☐ Planning department
   - ☐ Public works
   - ☐ Fire department
   - ☐ Other:
2. What is the primary mechanism for implementing the hazard mitigation plan?
3. What do you think is the ultimate value of the plan?
4. Who will be the primary user of the plan?

D. Regional Approaches for Hazard Mitigation

1. Were any regional issues or impacts considered during your jurisdiction's hazard mitigation planning process? If yes, please describe.
2. Which regional issue/impact from above was most significant, in your opinion?
3. Please rank the significance of the issue/impact related to future local government activities:
   - ☐ Not significant at all
   - ☐ Somewhat significant
   - ☐ Significant
   - ☐ Very significant
   - ☐ Don't know
4. What is your extent of knowledge about mitigation activities in neighboring jurisdictions upstream and upland?
   - ☐ No knowledge at all
   - ☐ Minimal knowledge
   - ☐ Adequate knowledge
   - ☐ Extensive knowledge
5. If no knowledge of mitigation activities in neighboring jurisdictions, what was the impact, if any, of this lack of knowledge on your jurisdiction's ability to mitigate flood hazards?
6. If information about mitigation activities in neighboring jurisdictions, please describe.
7. If information about mitigation actions in neighboring jurisdictions is known, are mitigation actions in neighboring jurisdictions *assisting* flood hazard mitigation within your jurisdiction?

8. If information about mitigation actions in neighboring jurisdictions is known, are mitigation actions in neighboring jurisdictions *impeding* flood hazard mitigation within your jurisdiction?
9. Were any regional or watershed-wide mitigation actions *considered* during the hazard mitigation planning process? If yes, please describe.
10. Which regional mitigation action from above would be most effective, in your opinion?
11. Please rank the effectiveness of this mitigation action related to future flood hazards:
    - ☐ Not effective at all
    - ☐ Somewhat effective
    - ☐ Effective
    - ☐ Very effective
    - ☐ Don't know
12. Were any of the above regional or watershed-wide mitigation actions *identified* for future implementation? If yes, which one(s)?
13. If yes, how will action(s) be implemented?
14. Have you ever gotten together with counterparts from other jurisdictions within the Tar River Basin? If yes, for what purpose?
15. To your knowledge, does your jurisdiction participate in any regional planning efforts? If yes, please describe.
16. Were any of these regional efforts successful in achieving specified goals? If yes, please describe.
17. Please rank the degree of success of the above regional effort:
    - ☐ Not successful at all
    - ☐ Somewhat successful
    - ☐ Successful
    - ☐ Very successful
    - ☐ Don't know
18. Did any of these regional efforts fail in achieving specified goals? If yes, please describe.
19. Please rank the degree to which the above regional effort failed:
    - ☐ Did not fail at all
    - ☐ Slightly failed
    - ☐ Failed
    - ☐ Greatly failed
    - ☐ Don't know
20. In your opinion, what are some of the challenges or obstacles to regional planning efforts?
21. Which obstacle from above is most significant, in your opinion?
22. Please rank the significance of the above obstacle related to regional planning efforts:
    - ☐ Not significant at all

☐ Somewhat significant

☐ Significant

☐ Very significant

☐ Don't know

23. In your opinion, what are some of the opportunities that exist for regional planning?
24. Which opportunity from above is most significant, in your opinion?
25. Please rank the significance of the above opportunity related to regional planning efforts:
    ☐ Not significant at all

    ☐ Somewhat significant

    ☐ Significant

    ☐ Very significant

    ☐ Don't know
26. Do you think it is politically feasible to implement a regional or watershed-wide approach for flood hazard mitigation? If yes, why?
27. If no, why?

E. State/Federal Programs

1. In your opinion, was the hazard mitigation process required by the Disaster Mitigation Act of 2000 valuable for your jurisdiction or done just to fulfill a requirement? If valuable, why?
2. What guidance was used during the development of your jurisdiction's hazard mitigation plan?
    ☐ FEMA's DMA 2000 State and Local Interim Criteria and "How-To" Guides

    ☐ NC State's Keeping Natural Hazards from Becoming Disasters: A Mitigation Planning Guidebook for Local Governments ("Green Book")

    ☐ Other:
3. How would you rate the effectiveness of the guidance used?
    ☐ Not effective at all

    ☐ Somewhat effective

    ☐ Effective

    ☐ Very effective

    ☐ Don't know
4. Were the requirements of DMA2K similar to other federal planning mandates implemented within your jurisdiction related to level of commitment of staff, time and budget resources?
    ☐ Required a lower level of resource commitment

    ☐ Required similar level of resource commitment

    ☐ Required a higher level of resource commitment

    ☐ Don't know (have not participated in other planning mandates)

5. Are there any previous or current federal/state planning requirements that are complementary with DMA2K requirements for hazard mitigation planning?
6. Are there any previous or current federal/state planning requirements that conflict with DMA2K requirements for hazard mitigation planning?
7. What could FEMA have done differently that would have helped hazard mitigation plan development and implementation processes?
8. What could the state have done differently that would have helped hazard mitigation plan development and implementation processes?

F. Summary

1. If there was an opportunity to *develop* and *implement* hazard mitigation plans at the watershed level, what sort of institutional arrangement would be most effective?
   - ☐ Federal
   - ☐ State
   - ☐ New regional entity
   - ☐ Ad hoc (through existing entity)
   - ☐ Informal coordination process between participating jurisdictions
2. If such an arrangement was to exist, would it be better if the organization conducted its activities based on a single objective (i.e., flood hazard mitigation) or multiple watershed objectives (i.e., water supply, water quality, etc.)
3. If such an arrangement was to exist, how would the organization best access state/federal programs? In other words, what changes in federal/state programs would be necessary?
4. Name of local elected official to interview (one who is objective and familiar with hazard mitigation) and contact information.

APPENDIX D: SUMMARY OF INTERVIEW RESPONSES

A. Summary of Interviews and Participants

The interviews included representatives from six different jurisdictions in the Tar River Basin. The jurisdictions were originally selected based on the following criteria: 1) coverage of the entire geographic scope of the river basin, in other words upstream and downstream locations as well as a mix of jurisdictions located inside and outside the Tar River floodplain were included; 2) inclusion in recent data collection efforts by David Brower and the Hazard Mitigation Clinic related to development management efforts; 3) for counties included, approximately 50 percent of the county's land area located within the Tar River Basin; and 4) plan developed in-house by local government staff or, if necessary, by the regional council of governments (COG) in which the jurisdiction is a member.[3] As a result, the following interviews were conducted:

- Six with planning staff (five from planning departments, one from emergency services)
- Five city/county managers
- Four local elected officials

At the time of the interviews, the local plans of three jurisdictions were considered to be "in progress"—either edits received from the state were in the process of being implemented by local staff or the plans were at NCDEM being reviewed by the state. The other three jurisdictions were informed by NCDEM that the local plan was approved at the state level and forwarded to FEMA for final approval. One key factor that may explain many of the responses received during the interviews is that all but one of jurisdiction suggested that the plan developed for DMA2K was an update of a previous plan completed immediately after Hurricane Floyd. The first hazard mitigation plans completed in five of the jurisdictions were developed as early as 1999 to ensure participation in federal recovery and mitigation programs. Only one local plan out of the six included in the data collection process was a stand-alone plan; the other five jurisdictions either initiated or participated in a multi-jurisdictional plan. All jurisdictions included in this analysis participate in the NFIP; four out of six also participate in CRS and have a current rating of 8.

B. Perceived Value of the Planning Process

Fourteen out of fifteen participants responded that the **primary objective** for initiating the DMA2K planning process was primarily to fulfill the federal requirement; one elected official stated that the planning process was brought to the jurisdiction's attention through the leadership of the staff. However, when asked about the ultimate value of the plan, all respondents suggested that the plan includes benefits beyond fulfilling the federal requirement to ensure funding eligibility in case of a future disaster. Specifically, responses can be organized into the following categories (the number in parentheses indicates the total responses for each category):

- Plan of action specific to hazard mitigation (5)
- Decision support tool for future land use and development (3)
- Educational tool for the public (1)
- Educational tool for staff (1)
- Base information related to vulnerability (1)

[3] After the jurisdictions were selected and interviews initiated, it was discovered that one jurisdiction would submit a local hazard mitigation plan as part of a multi-jurisdictional plan developed by a consultant. However, the decision was made to include this jurisdiction in the data collection process due to the limited number of jurisdictions that actually submitted to FEMA local hazard mitigation plans that had been developed in-house.

- Variety including decision support tool, reference document in daily activities, plan of action for hazard mitigation and base information for future planning requirements (2)

One additional value not mentioned above but suggested during many interviews was the extent of consultation and coordination within local governments as well as between jurisdictions within one county that occurred during the development process. All jurisdictions assigned responsibility to one department for plan development but when asked which other representatives or departments of local governments participated in the development in the plan, are responsible for plan implementation or will use the plan after implementation, multiple responses were received from each interviewee. In other words, multiple stakeholders and local governmental departments had varying degrees of impact on the development of the plan or will be directly impacted by the implementation of the plan within each jurisdiction. As one participant stated later in the interview, he gained "a better understanding of who does what for coordination purposes."

Risk assessment data was collected on a jurisdiction-wide basis from a combination of sources including the jurisdiction itself and the state. Participants were asked if the risk assessment data provided any new insights previously unknown; six out of fifteen stated that nothing new was learned since the first risk assessment process was completed for the jurisdictions' original hazard mitigation plan. Other responses suggested that new issues related to critical facilities, dam safety and other natural hazards were raised as a result of the most recent risk assessment process. The dam safety issue, in particular, and some of the other natural hazards made apparent by the risk assessment process represent regional issues of concern.

A similar question was asked of city/county managers and planning staff related to the **adoption process**; specifically, "please describe, in your opinion, any results of the adoption process?" Out of the nine responses received, five suggested the only result of the adoption process was that the plan was forwarded to the state for review and approval. According to several respondents, heightened awareness and discussion about hazard mitigation was apparent in the years following Hurricane Floyd. Three respondents suggested that the adoption process produced a greater awareness within local government including elected officials. Two respondents suggested that the adoption process resulted in subsequent discussions related to disseminating information to the public about how to protect themselves and amending the floodplain ordinance to increase the freeboard height.

All elected officials stated that their level of involvement in the development of the plan was primarily at the point of adoption. City/county managers and planning staff, because of a greater involvement in the plan development process, were asked about lessons learned as a result of the process. The following is a brief summary of these responses organized into two categories—governmental processes and hazard mitigation planning.

Governmental Processes

- The rules regarding the federal requirements changed so much that it created a real problem at the local level;
- Due to the state's previous focus related to hazard mitigation (i.e., NFIP), this federal requirement highlighted the need to streamline processes between the state and federal government;
- NCDEM's review process lacked consistency while FEMA's requirement were too redundant;
- Multi-jurisdictional processes were extremely difficult to get everyone together particularly because the process lacked a forum for elected officials to look at the overall situation and need;
- It was difficult to get everyone who belonged at the table to come to the table; everyone was so busy that the process was disjointed and pushed through to meet the federal requirement; and
- The final document will be useful intra-departmentally for cross-referencing with other documents, programs and plans.

Hazard Mitigation Planning

- It was important to be realistic about goals and objectives as a local government with limited resources; thinking about hazard mitigation more comprehensively allowed us to be more realistic than we were during the development of the hazard mitigation plan immediately following Hurricane Floyd;
- City staff was really on board during the planning process; they realize the importance of having a plan of action related to hazard mitigation;
- There are vulnerable areas and we need to be proactive so to prevent the same level of damage that resulted from the 1999 floods;
- There is no right or wrong; the only thing you can do is limit the amount of structures and costs associated with development in the floodplain and think about the extra steps needed to reduce risk like relocating and elevating infrastructure and facilities; and
- Given our previous experience with floods, we know that we have to go above and beyond the minimum requirements and that being as thorough as possible is the way to avoid another catastrophe.

C. Mitigation at the Local Level

FEMA groups **mitigation actions** into six broad categories—prevention, property protection, public education and awareness, natural resources protection, emergency services, and structural projects—in Chapter 2: Developing the Mitigation Plan of *State and Local Mitigation Planning How-to Guides.* Five out of 15 respondents suggested that all of the above types were considered during the planning process. Across all staff, city/county managers and elected officials asked to identify the primary type of mitigation actions emphasized within their jurisdiction, prevention was suggested by 40 percent of the interview participants. The most common prevention action mentioned was revision to zoning and floodplain ordinances. Three out of the fifteen respondents suggested property protection and, specifically, buyout programs were suggested as a primary focus of local hazard mitigation activities. Two respondents suggested public education and awareness as an emphasis of the local jurisdiction related to hazard mitigation; however, several other interviewees discussed to varying degrees the need for greater education about natural hazards among the public as well as local and state government.

Accordingly, existing ordinances, plans and programs were most frequently suggested as the primary **mechanism for implementing** local hazard mitigation plans. All elected officials interviewed suggested modifications to existing ordinances as the primary implementation tool; two out of five city/county managers and two out of six staff members interviewed from each of the jurisdictions specifically suggested existing ordinances. While not everyone who suggested existing ordinances as the primary implementation tool mentioned the same ordinance, a wide spectrum of existing ordinances were mentioned including zoning, land use development, flood damage prevention, water and sewer extension, subdivision and unified development ordinances. Forty percent of all respondents mentioned a combination of existing and potential ordinances, plans and programs would be used to implement the local hazard mitigation plan. As one respondent stated, “implement what you can with what is existing and if can’t do the job with what we already have, we will create new ones.”

Local elected officials were specifically asked about local jurisdictions’ **priorities** related to overall decisionmaking processes and how hazard mitigation fits in as a priority. While none of the four elected officials from different jurisdictions mentioned hazard mitigation as a top priority, flood recovery or mitigation was linked to each jurisdiction’s top priorities when asked specifically how hazard mitigation fits in as a priority. For example, one elected official suggested redevelopment and revitalization in certain areas of the city as the jurisdiction’s top priorities; revitalization/redevelopment strategies and areas were identified in the comprehensive plan during the latest plan update along with the appropriate

hazard mitigation actions. A second example was provided by an elected official who mentioned that development pressures and growth potential within the jurisdiction is a high priority but modifications to ordinances such as freeboard requirements has resulted in a political debate related to property protection versus utilization. Other top priorities mentioned were job creation, overall economic development, creation of a county water system, and an inadequate housing stock.

Staff and city/county managers were asked about their level of knowledge about hazard mitigation activities in **neighboring jurisdictions**. One respondent suggested that his level of knowledge was above adequate because of his previous position with the COG and related hazard mitigation planning responsibilities. He further suggested that other jurisdictions are developing analogous plans because working with similar regional conditions and the same set of NCDEM/FEMA recommended mitigation actions. Four out of eleven suggested an adequate level of knowledge and three have a minimal level of knowledge. Finally, three out of eleven suggested no knowledge of mitigation activities in neighboring jurisdictions at all.

Of the eight participants who suggested some level of knowledge, none were able to describe a specific action within a neighboring jurisdiction. One exception to this is provided by the Town of Rocky Mount which straddles two counties—Nash and Edgecombe. One respondent suggested that the three jurisdictions are inseparable; specifically, "any joint work, ability to render services, or coordination is all part of the patchwork of responsibility to do whatever it takes to make sure people are safe." Another respondent mentioned that the hazard mitigation efforts of each county are reported on at monthly meetings of the Emergency Management Coordinating Commission organized by the Town of Rocky Mount immediately following Hurricane Floyd. Several other respondents suggested that the lack of knowledge across neighboring jurisdictions is due to differences in geographic or population size between jurisdictions and variations in scope of mitigation efforts such as CRS and non-CRS communities.

The range of responses varied significantly when all participants were asked if **regional issues** were considered during the mitigation planning process. Participants were specifically asked to think broader than the county level and more at a river basin scale. Three out of fifteen said that regional issues were not considered during the development of the local hazard mitigation plan because the planning process was jurisdiction specific. Two out of fifteen said a definite yes; one referenced the recent USACE agreement with municipalities to fund a study of Stony Creek, which is considered to be flood-prone. Another respondent mentioned that a discussion of the dam at Kerr Lake was included in the hazard mitigation plan. The remaining ten participants were not as specific as to whether regional issues were considered but did mention the following regional issues ordered from highest to lowest frequency of responses: Tar Pamlico Nutrient Strategy/Non-point Source Rules, information sharing related to hazard mitigation process, Kerr Lake Dam, risk assessment data, and upstream development impacts on the Tar River.

D. Regional Approaches

Each participant was asked about **interactions with counterparts** from other jurisdictions within the Tar River Basin. The responses are organized by staff, city/county manager and elected officials. One elected official responded that he does not get together with elected officials from other jurisdictions within the Tar River Basin because of legality issues related to sunset laws. Another elected official suggested that this type of interaction was more appropriate at the staff level but mentioned public water and sewer service as an issue of regional concern for which he has attended meetings. One official mentioned a variety of meetings in which he and his counterparts attended in the past including state organized hazard mitigation informational sessions, economic development partnership meetings, COG organized meetings related to aging and workforce development, League of Municipalities' functions, and lobbying activities

related to electric utilities. Another respondent also mentioned lobbying of legislators for regional issues like roads as one way he gets together with his counterparts.

Of the five city/county managers interviewed, three suggested that staff attend more meetings with counterparts than managers. One manager serves as chair of a city and county managers committee that meets quarterly to discuss public water and sewer services in a five county area while another manager referenced his membership in the Tar Pamlico River Basin Association and meetings related to implementing the nutrient reduction regulations. However, staff's responses did not suggest that planning staff frequently meet with counterparts. One staff member responded a definitive no when asked if he meets with counterparts from other jurisdictions; two staff members responded that they did not attend meetings outside of the county; and the remaining three mentioned meetings organized by the COG in which their jurisdiction participates. One of the staff members participating in meetings at the COG level also suggested his participation in the Upper Neuse River Basin Association. It was indicated by several respondents that engineering and public works staff primarily attend meetings outside the jurisdiction related to stormwater management and the Tar Pamlico nutrient reduction regulations.

City/county managers and planning staff were asked to identify regional planning efforts in which the local jurisdiction participates. Specifically, responses can be organized into the following types of regional planning efforts (the number in parentheses indicates the number of responses for each type out of eleven total responses):

- Transportation—either in a regional planning organization, RPO, or metropolitan planning organization, MPO (9)
- Economic development (4)
- Natural resources—either in the Tar Pamlico or Upper Neuse River Basin Associations (2)

Other responses related to regional planning efforts included aging, health care, statewide mapping project, state emergency services (i.e., the VIPER communication system), hazard mitigation process, utility expansion and NCAPA regional meetings. Many of the above regional planning efforts were either initiated or coordinated by area COGs. When asked to identify which effort is most successful, the most common response suggested that the work of the RPO or MPO is either very successful or successful largely due to the funding and issue recognition the effort has brought to the region.

All interviewees were asked to identify some of the **challenges or obstacles** to regional planning efforts. Similar to all other questions, respondents were provided the opportunity to answer the question with an open response first and then were provided a list of possible responses. These predetermined response options were identified during a previous literature review and included "lack of political will," "limited staff capacity," "limited financial capacity," "security issues related to data," "funding competition," and "higher priority within jurisdiction." None of the respondents selected a response option from above as the most significant challenge. While many suggested more than one challenge, the following summarizes the most significant challenges in the opinions of the respondents (the number in parentheses indicates the number of responses out of fifteen total responses):

- Turf protection/territorial issues (4)
- No formal mechanism to do regional planning/bring jurisdictions together (4)
- Lack of education related to alternatives/thinking "outside the box" (3)
- Differing interests/lack of agreement during process (2)
- Lack of a regional mindset within individual jurisdictions (2)

In contrast, all interviewees were asked to identify **opportunities for regional planning** or, in other words, ways to sell regional planning efforts in and outside of their jurisdiction. Predetermined responses

provided included: “data and information sharing,” staff/expertise sharing,” “cost savings,” “regional growth management,” and “potential funding opportunities.” While many of the fifteen participants identified potential opportunities from the list above, the following summarizes some of the more significant opportunities in the opinion of the respondents (the number in parentheses indicates the number of responses out of fifteen total responses):

- Sharing of costs—service provision, economic development, meeting regulatory requirements (5)
- Data, staff and expertise sharing (5)
- Market as a region for economic development (3)
- Smart growth or regional growth management (1)
- Potential funding opportunities (1)

All participants were asked outright if it is **politically feasible** to implement a regional or watershed-wide approach for flood hazard mitigation. Only one staff member responded that it was not politically feasible because a major rethinking of ‘business as usual’ would be needed. The five other staff members interviewed suggested a watershed-wide approach is politically feasible. All five managers interviewed also suggested that a regional or watershed wide approach is politically feasible. Those who did think that a watershed-wide approach was politically feasible provided the following explanations: previous experiences with flooding, good working relationships in region, demand/support for action by public, and recognition of overall benefits. Several of these participants also said that such an effort is contingent on state leadership, federal and state financial support and a clear presentation of costs and responsibilities for local government.

In comparison, the elected officials interviewed were reluctant to suggest definitely that such an approach is politically feasible. Elected officials responses included: “it would be difficult but possible,” “very hard,” “in theory you could make a case for doing it,” and “don’t know why it hasn’t already happened.” Two elected officials suggested that the Pamlico Tar River Foundation addresses similar regional concerns. Another elected official suggested that an impetus, perhaps the state, would be needed especially in areas that have not experienced flood disasters. The fourth elected official suggested that a locality could be the impetus but the state would have to provide the mechanism for such a regional planning effort: “the difficultly lies within the fact that County cannot bring in other counties to implement policies and plans.” The same elected official suggested that regional coordination and communication is very much based on the personalities involved including the level of trust, confidence and ability of all players.

E. Potential Organizational Structures

The following question was the first in a series of three hypothetical questions related to a regional institutional approach toward flood hazard mitigation asked of all interviewees:

If there was an opportunity to *develop* and *implement* hazard mitigation plans at the watershed level, what sort of **institutional arrangement** would be most effective?

Participants were provided a predetermined list of potential responses and then asked to further describe the selection in his/her own words. The potential responses included “federal,” “state,” “new regional entity,” “ad hoc (through an existing entity),” “formal coordination process between jurisdictions,” and “informal coordination process between jurisdictions.”

Staff Responses

- State (3)

- Ad hoc or through an existing entity (3)

Manager Responses
- State (1)
- Ad hoc or through an existing entity (2)
- Formal coordination process between jurisdictions (2)

Elected Official Responses
- Federal (1)
- New regional entity (2)
- Informal coordination process between jurisdictions (1)

The above responses illustrate that there is no consensus about the type of institutional arrangement that would be most effective. Across all respondents, 33 percent suggested that an ad hoc or existing entity should also be responsible for developing and implementing hazard mitigation plans at the watershed level. Twenty-seven percent think the state should take the lead role in creating and maintaining an institutional arrangement for developing and implementing hazard mitigation plans at the watershed level. While five out of fifteen respondents specifically mentioned that no one wants another layer of government, 13 percent suggested that a new regional entity would be most effective. Another 13 percent suggested formal coordination processes between jurisdictions would be most effective. Seven percent suggested informal coordination process between jurisdictions would be most effective and another seven percent suggested the federal government should take the lead in establishing a regional institutional arrangement.

Those who suggested an ad hoc or existing entity specifically mentioned COGs as a potential institutional arrangement for regional hazard mitigation. The reasons supporting COGs as the institutional arrangement for regional hazard mitigation include: COGs already exist and serve in this capacity, COGs comprise diverse resources including member dues and technical knowledge and have proven to be successful related to other planning issues. In addition, such a structure would require the involvement of local officials and managers who are the primary participants in COG efforts. In order to address watershed-level issues, multiple COGs would need to come together; as long as similar in quality related to planning efforts, this would be relatively simple. Several respondents also suggested that the state would have to provide resources (e.g., statewide mapping project) and incentives (i.e., the carrot with the stick) to support such a regional planning effort implemented through COGs.

The state was suggested as the most effective regional institutional arrangement for the following reasons: ensure an equitable process, ensure incentives in conjunction with mandates, mimic MPO planning efforts, streamline the hazard mitigation planning process and provide a framework for coordination that counteracts the current mindset. One respondent suggested that, in North Carolina, waters are classified as belonging to the state and, consequently, such planning efforts are the state's responsibility. The respondent further suggested that the state's Division of Water Quality and Division of Emergency Management should work together to develop plans that balance environmental protection and development issues.

The creation of new regional entities to develop and implement watershed-wide hazard mitigation plans was suggested by two respondents who were primarily concerned with overloading local elected officials with additional responsibility or agencies focused other purposes. State and federal support combined with local leadership established through a new regional entity would also avoid the problem of unfunded mandates and promote local buy-in. While several respondents suggested that unfunded mandates were problematic for local governments, others also suggested that federal mandates typically result in the implementation of bare minimum requirements. However, one respondent suggested that a federal

mandate for similar regional planning efforts like stormwater and water quality have had positive effects on the activities of local government.

Finally, coordination processes—formal and informal—were suggested by three respondents to avoid creating another layer of government and provide local governments with the choice related to participation in such a regional effort. One respondent mentioned the Stony Creek study as an example of a voluntary formal coordination process that has achieved successful levels of participation from different municipalities. Another respondent suggested that elected officials would be the most appropriate participants in such a regional coordination process while another respondent suggested the process would entail a formal memorandum of agreement (MOU) that city managers draft and bring to respective governing boards for approval.

Participants were then asked whether such an institutional arrangement would be more effective if activities were conducted based on a **single objective** (i.e., flood hazard mitigation) or **multiple watershed objectives** (i.e., water supply, water quality, etc.). Sixty-seven percent of all participants suggested that the potential institutional arrangement should conduct its activities on a multiple objective basis. Six of the respondents who recommended a multi-objective approach explained that water resource issues within a watershed—water quality, water quantity, and hazard mitigation—are interconnected or inter-related so must address all because of 'domino effect.' In addition, two respondents in this category suggested an organizational structure that included sub-objectives and committees to address multi-faceted issues under the umbrella of watershed protection. Three respondents suggested that a multi-objective approach would be more efficient because the expertise, time and effort gathered together to address one issue could address multiple related issues. Twenty-seven percent of the participants suggest a single objective approach—flood hazard mitigation only—would be easier to implement; a more focused approach that minimizes the need for those participating to multi-task is essential when multiple jurisdictions are involved. One respondent suggested that a regional hazard mitigation approach should include manmade and other natural hazards; not just floods. Another respondent suggested that a single objective approach should be implemented initially and, if successful, expanded to include multiple objectives to get more jurisdictions on board and, thus, truly be a regional approach.

Finally, participants were asked what, if any, changes in **federal/state programs** would be necessary to effectively interact with such a regional institutional approach. In other words, how would the regional organization or arrangement best access state/federal programs? The following is a brief summary of participants' responses organized into three categories—staffing, funding and technical assistance.

Funding

- More money is needed and, specifically, grants for implementation. (3)
- Most of our resources come through the state so a similar process could be undertaken within the state legislature to obtain funding in addition to participation from municipalities. I an addition, the state has the resources and knows best how to access federal financial assistance. (2)
- The arrangement should be proactive and contact state and federal government representatives to ask for financial assistance.
- State should agree to give a certain amount of money to jurisdictions if they agree to work together on such a regional planning effort.
- Need money at the jurisdictional level because what effects one jurisdiction many not affect another and all jurisdictions should not be treated the same.
- Currently, grants can only be obtained by counties/municipalities. If a COG is identified with regional planning/implementation responsibilities then funding will need to be based on the approvals of each participating jurisdiction so that money does not get redirected from one jurisdiction to another.
- Need a lead agency so that money would go to one entity to ensure accounting processes are not overly complicated.

Staffing

- If localities are required to interact in a significant programmatic process, additional staff is needed ideally with training in public policy so the rationale for such a regional effort is understood and not perceived as just another mandate.
- The level of data and resources are good but only if you have the staff capacity and capability to work with data/resources.

Technical Assistance

- Provide training and technical support similar to the way NCDEM's hazard mitigation section did during the DMA2K planning process.
- Need technical assistance at the jurisdictional level because what effects one jurisdiction many not affect another and all jurisdictions should not be treated the same.

Interagency Floodplain Management Review Committee. June 1994. Sharing the challenge: floodplain management into the 21st century. Prepared for the Administration Floodplain Management Task Force. Washington, DC: US Government Printing Office.

Interagency Floodplain Management Task Force. 1994. A Unified National Program for Floodplain Management, FEMA Publication 248. Washington D.C: FEMA.

Interagency Workgroup on Wetland Restoration. An Introduction and User's Guide to Wetland Restoration, Creation and Enhancement. Washington, D.C: NOAA and EPA.

Katz, Bruce, and Muro, Marc. 2003. The smart money is on smart growth. Prepared for the Brookings Institution. Washington, D.C.: The Brookings Institution.

Khator, Renu and Brunson, Nicole Ayers. 2001. "Creating networks for interorganizational settings: a two-year follow-up study on determinants." In Myrna Mandell, Ed. Getting results through collaboration: networks and network structures for public policy and management. Westport, Connecticut: Quorum Books, 154-166.

Kucken, Darlene. March 29, 2005. Direct correspondence.

May, Peter J. and Robert E. Deyle. 1998. "Governing Land Use in Hazardous Areas with a Patchwork System." In Burby Raymond J., Ed. Cooperating with Nature: Confronting Natural Hazards with Land Use Planning for Sustainable Communities. Washington, DC: Joseph Henry Press, Chapter 3.

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

Meagher, John. 2004. The Benefits of Integrating Pre-Disaster Mitigation and Watershed Management. A briefing paper submitted for the 2005 Association of State Floodplain Managers Conference. Washington, DC: USEPA Wetlands Division.

Mecklenburg County Storm Water Services Division. October 25, 1999. Mecklenburg County floodplain mapping summary report.

Metropolitan Transportation Commission Website. www.mtc.ca.gov. Last accessed April 2, 2005.

Metropolitan Transportation Commission. 2001. Annual Report.

Montgomery, David R., et al. June 1995. "Watershed analysis as a framework for implementing ecosystem management." Water Resources Bulletin. Vol. 31, no. 3, p. 369-386.

National Association of Regional Councils Website. www.narc.org. Last accessed April 14, 2005.

National Research Council. 1999. New strategies for America's watersheds. Washington, DC: National Academy of Sciences.

National Weather Service, Raleigh, North Carolina Website. www4.ncsu.edu/~nwsfo/storage/cases/19990915/. Last accessed April 10, 2005.

Natural Hazards Center. 2004. The Project Impact spirit:: sustaining local loss reduction partnerships. A session summary from the 2004 Annual Hazards Research and Applications Workshop. Boulder, Colorado: UC Boulder Natural Hazards Center.

Natural Resources Conservation Service. January 2001. Data analysis prepared for the US Department of Agriculture. Washington, D.C.: USDA.

Natural Resources Inventory. 2001. Data analysis prepared for the US Department of Agriculture. Washington, D.C.: USDA.

North Carolina Division of Coastal Management Website. http://dcm2.enr.state.nc.us/. Last accessed April 2, 2005.

North Carolina Division of Emergency Management. August 2001. Draft State Natural Hazards Mitigation Plan (Section 322).

North Carolina Division of Emergency Management Website. www.dem.dcc.state.nc.us. Last accessed April 12, 2005.

North Carolina Division of Water Quality. 2004. Tar-Pamlico River Basinwide Water Quality Plan. Prepared by the Basinwide Planning Unit.

North Carolina Division of Water Quality. 1999. Tar-Pamlico River Basinwide Water Quality Plan. Prepared by the Basinwide Planning Unit. Last accessed via h2o.enr.state.nc.us/basinwide/tarpam_wq_management_plan.htm on April 13, 2005.

North Carolina Division of Water Quality. Nonpoint Source Management Program:: Tar-Pamlico Nutrient Strategy Website. http://h2o.enr.state.nc.us/nps/tarpam.htm. Last accessed April 12, 2005.

North Carolina Division of Water Quality. Water Supply Watershed Protection Program Website. h2o.enr.state.nc.us/wswp.htm. Last accessed April 14, 2005.

North Carolina Smart Growth Alliance. www.ncsmartgrowth.org. Last accessed October 29, 2004.

Office of Management and Budget. June 1998. Federal Programs Offering Non-structural Flood Recovery and Floodplain Management Alternatives. Washington, D.C.: OMB.

Olshansky, Robert B. and Jack D. Kartez. 1998. "Managing land use to build resilience." In Burby, Raymond J., Ed. Cooperating with Nature: Confronting Natural Hazards with Land Use Planning for Sustainable Communities. Washington, DC: Joseph Henry Press, Chapter 2.

Platt, Rutherford. 1999. "Introduction: disasters before 1950: coping with Congress." In Platt, Rutherford, Ed. Disasters and Democracy: the Politics of Extreme Natural Events. Washington, DC: Island Press.

Platt, Rutherford. 1999. "Shouldering the burden: federal assumption of disaster costs." In Platt, Rutherford, Ed. Disasters and Democracy: the Politics of Extreme Natural Events. Washington, DC: Island Press, Chapter 1.

Platt, Rutherford. 1998. "Planning and land use adjustments in historical perspective." In Burby, Raymond J., Ed. Cooperating with Nature: Confronting Natural Hazards with Land Use Planning for Sustainable Communities. Washington, DC: Joseph Henry Press, Chapter 2.

Platt, Rutherford and Claire Rubin. 1999. "Stemming the losses: the quest for hazard mitigation." In Platt, Rutherford, Ed. Disasters and Democracy: the Politics of Extreme Natural Events. Washington, DC: Island Press, Chapter 3.

Riley, Ann L. 1998. Restoring Streams in Cities: A Guide for Planners, Policymakers, and Citizens. Washington, D.C.: Island Press.

Schad, Theodore M. "Water Policy: Who Should Do What." Water Resources Update, Spring 1998, pp. 51-60.

Schwab, Jim, et al. 1998. Planning for Post-Disaster Recovery and Reconstruction, PAS Report 483/484, Chicago, IL: American Planning Association.

Source Water Protection Roundtable. Final report. August 2004. Roundtable held in Washington D.C., July 29-30, 2003. Madison, WI: Association of State Floodplain Managers.

Tampa Bay Estuary Program. 1996. Charting the course for the course: the comprehensive conservation and management plan for Tampa Bay. St. Petersburg, Florida: TBEP and USEPA Region IV.

Tampa Bay Estuary Program Website. www.tbep.org. Last accessed April 2, 2005.

Task Force on the Natural and Beneficial Functions of the Floodplain. 2002. The natural and beneficial functions of floodplains: reducing floods losses by protecting and restoring the floodplain environment. A report for Congress. Washington, DC: FEMA, 409, June 2002.

Tetra Tech, Inc. 2004. Making the connection: smart growth and watershed protection. Last accessed via http://chesapeake.tetratech-ffx.com/wacd2/smart1/index.htm on August 25, 2004. Watershed academy module (DRAFT) prepared for the Environmental Protection Agency. Washington, D.C.: EPA.

URS. 2004. Flood mitigation plan for Ventura County, California. Prepared for the Ventura County Watershed Protection District.

US Senate Committee on Banking and Currency. 1967. National Flood Insurance Act of 1967. Washington DC: US Government Printing Office.

Viessman, W. and C. Welty. 1985. Water Management Technology and Institutions. New York: Harper and Row.