

# Dane County Flood Mitigation Plan Executive Summary



Prepared by

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In Cooperation with  
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## Introduction

The purpose of this plan is to conduct an assessment of the flood hazard in Dane County and to describe actions and programs that can be implemented by Dane County government to minimize the vulnerability to flood losses in the County.

Dane County has been affected by flooding on numerous occasions in the past. Past floods have caused millions of dollars of damages in the County. All sectors of life in the County are impacted to some degree. Floods have caused significant private property damage, damage to public infrastructure, crop losses, environmental degradation, and lost recreational opportunities. There is urgency to address these issues as the frequency and magnitude of flooding problems appears to be growing.

The problem of flooding in Dane County is complex and is not limited to damages occurring in the mapped floodplains. Nor can the problem be described by any other single variable. The causes and problems of flooding differ widely across the County and there are many contributing factors; changing land use patterns, development in high-risk areas, stormwater management practices, and complex hydrologic processes all play a part. The intent of the Flood Mitigation Plan is to break these matters down in order to better understand the interplay between them. But the Plan is not intended as only a descriptive exercise. Rather, it aims to use this understanding to formulate actions that can help to reduce the impact of future floods.

Three basic principles underpin the goals and policies of the Plan:

1. Water should be considered as a valuable resource rather than a hazard. The County should promote good stewardship of our water resources in planning for the future. Good stewardship can make the most of this resource for us and for our children. Poor stewardship will lead to ever increasing hazards.
2. The action of one property owner or community should not increase the flood risk of other property owners or communities unless the impact is mitigated through community or watershed planning or other actions.
3. Climate change is leading to increased seasonal variability including more intense rainfall and drought conditions. The implications of this increasing variability must be considered in our water management practices.

Finally, the plan recognizes the interconnected nature of water resources and the shortcomings of a plan that extracts a single element (flooding) from larger water management issues. The occurrence of flooding is only one element of a highly complex hydrologic system. There are no simple solutions. Management of water resources is entwined in social and economic processes and values that are well beyond the scope of the Plan. Though crucially important, these larger issues cannot be satisfactorily addressed in the Plan. Rather, these issues should be thoroughly discussed in the County's comprehensive planning process, or within the context of a regional comprehensive water management plan.

## Oversight Structure

The Dane County Lakes and Watershed Commission has primary oversight of the flood mitigation planning effort. The Commission is a coordinating and advisory agency within Dane County government. The charge of the Commission is to protect and improve water quality, as well as the scenic, economic, recreational, and environmental value of Dane County's water resources. The Commission has ten members, representing rural and urban areas, including:

- County Board Supervisors (2 from Madison and 2 from outside Madison);
- A representative of the Dane County Towns Association;
- A representative from cities and villages outside Madison;
- A member designated by the Dane County Executive;
- A member designated by the mayor of Madison;
- A citizen from Madison; and
- A representative of the Yahara Lakes Association.

Through the Lakes and Watershed Commission, Dane County has unique authority to establish standards for local regulations and ordinances to protect water resources that apply within cities and villages as well as the unincorporated areas of the County.

## Public Participation

The Flood Mitigation Plan was developed through the involvement of Dane County citizens, local units of government, stakeholder groups, the Lakes and Watershed Commission, and various County departments. The County's Flood Mitigation Planning Committee, led by the Department of Emergency Management guided the planning process, collected and evaluated data, organized public outreach efforts, provided specialized knowledge, developed recommendations, and drafted the Plan.

The planning process sought public input at numerous stages of the plan development.

- To gain an understanding of the local flooding problems and impacts, planning team members interviewed leaders from all 34 Towns, 19 Villages, 8 Cities, and 22 Sanitary Districts in the County.
- Five public meetings were held throughout the County to develop and evaluate alternative solutions to address the identified problems.
- The draft plan was posted on the Lakes and Watershed Commission's website. County Board members, local officials, and stakeholder groups and individuals were notified of its availability and invited to review and comment on the Plan.
- A focus group of key stakeholder groups was conducted to evaluate and guide revision of the draft plan.
- At least one public hearing will be held as part of the Plan adoption process.

## Plan Contents

The Plan is intended as a comprehensive assessment of existing conditions and problems as related to flooding in Dane County, with strategies for their resolution. The Plan and appendices contain the following elements:

- A description of Dane County including population trends, the physical setting, major drainage basins, environmentally sensitive areas, land use, and other natural hazards besides flooding.
- A summary of the County's existing flood management programs, including relevant zoning ordinances, land division regulations, and emergency response plans.
- A detailed description of the planning and public input processes.
- A detailed assessment of past flood events and impacts, including an assessment of cause and effect relationships.
- A description of alternative philosophies and strategies to mitigate flooding.
- Recommendations, including goals, policies, and objectives.
- An implementation strategy.

## Flood Damage Assessment

Dane County received Presidential disaster declarations for widespread flooding twice in the last decade: 1993 and 2000. Significant damages were also recorded in 1996. Cumulative losses for these three years exceed \$42 million, including private, public and agricultural damages.

The survey and assessment of past flood events shows that there is a wide range of factors that contribute to flooding problems. Dane County is primarily a drainage area. The County fully or nearly fully contains the headwaters of most of the rivers and streams that flow through and out of the County. While there are predictors of where floods will occur and the impacts that will result, Dane County does not have a major river and associated floodplain system that can be used to predict a damage potential given a certain probability flood. There are exceptions such as Black Earth Creek and Koshkonong Creek where flooding does typically occur as riverine flooding of a well-defined floodplain. The Yahara River and chain of lakes is another such exception. Flooding around the chain of lakes is not typical riverine flooding, however, the impact of flooding can be readily predicted given lake level elevations.

## Influences Contributing to Flood Problems

### Development in Flood-prone Areas (Areas with inherent flood risk)

There are areas of the County that when developed, have an inherent risk of flooding and resulting flood damage. These typically are areas that in their natural state, are associated with floodplains, hydric soil types, low-lying shorelands, wetlands (existing or drained) and steep slopes with highly erodible soils.

### Impediments to the Flow of Water

Changes in stream conditions and impediments to the flow of water were identified as a significant factor in increasing flood problems along the rivers and streams of the County. Impediments to flow reduce the overall capacity of the stream to convey water and cause water to back-up behind the blockage. These impediments include blockages caused by accumulation of sediment, over growth of vegetation, or excessive debris in the stream channel. Reduced conveyance capacity and blockages can and do occur in all components of the natural and human-made components of the drainage system, including detention ponds, stream channels, drainage ditches and culverts.

### Loss of Wetlands

Dane County has experienced a significant loss of wetlands over the past half century. Approximately two-thirds of the County's wetlands have been drained to produce farm fields or have been filled or paved to prepare for development.

Healthy wetlands have the potential to store large volumes of floodwater. As wetlands become destroyed or degraded, their capacity to store water may be reduced. Water that would otherwise have been stored in the wetlands then contributes to increasing flood levels and flows.

### Upland Development and Stormwater Issues

Dane County is among the fastest growing and developing counties in the State. The challenges of managing this rapid development are wide-ranging, however, one of the more significant impacts is the effect of development on the hydrology of the watershed. The effect of upstream development on downstream properties was widely recognized as significant contributing factor in Dane County's flood problems. In fact, development and other changes to the landscape in areas far outside the floodplain can have a profound impact on the magnitude and frequency of downstream flooding. This is a highly complex issue that includes elements of land-use decision-making, property rights, intergovernmental cooperation (or lack of), as well as the hydrology of the watershed and stormwater management practices. Many of these elements are well beyond the scope and charge of the Plan.

### The Effects of Urbanization

Urbanization is one of the most severe land use impacts in terms of its lasting effects on hydrology, due to the much higher percentages of impervious or paved areas covering the land. Rural land surfaces are almost completely pervious, while about one-third of the land surface in urban areas is covered by rooftops and paved areas. The main effects of urbanization on the hydrology of an area include:

- An increase in the total amount of rainfall running off the surface of the land;
- A decrease in the amount of rainfall infiltrating into the soil;
- More rapid runoff and much higher peak flows; and
- Reduced baseflows in streams during dry weather periods.

### Stormwater Management

Stormwater management in urban areas has traditionally focused on safely conveying and temporarily storing and slowly releasing water runoff to control peak flows and downstream flooding. This has been accomplished largely through “dry” and, to a lesser extent, “wet” detention basins. Management practices emphasizing stormwater infiltration and groundwater recharge have not received significant attention until recent years. Infiltration practices can, however, provide significant groundwater recharge, pollution control, and floodwater control benefits, depending on the degree of storage and infiltration achieved.

The County’s new stormwater management ordinance includes provisions for regulation of peak flow rates leaving developments adding over 20,000 square feet of new impervious surface area. The ordinance has been in effect for a little more than one year as of the writing of the Plan and its effectiveness has not yet been evaluated. The survey and public input process did, however, identify a number of concerns that should be further evaluated:

- There is no restriction of the total volume of water allowed to leave new developments. Peak flow rates are restricted, but volumes are not. Urbanization and increasing impervious surface areas tend to increase both the rate and the volume of stormwater runoff. Particularly in the case of the Yahara Lakes, it appears that the lakes are acting as a large wet detention basin, holding ever-increasing volumes of stormwater runoff. The rate of flow into the lakes may be the same as pre-developed conditions, but the overall volume of water fed to the lakes appears to be increasing. Since the system can drain at only a relatively low rate, the effect is that in heavy rains, or sustained rains with saturated soils, the lake levels rise quickly and lower slowly. This is viewed as one of the more significant of several contributing factors in sustained flooding along the Yahara system.
- The ordinance restricts flow from the 2- and 10-year storms. Many comments received indicated that to reduce downstream flood damages, the flow from larger storms, up to the 100-year storm should be restricted.
- There is no requirement for coordination of drainage among developments. Numerous developments in the same watershed may all deliver stormwater to the same stream channel. Each of the developments could be in compliance with the ordinance, however, the cumulative effect could be a significant overloading of the conveyance capacity of the stream. Survey respondents and other public comments have indicated a concern with this cumulative effect on increasing downstream flood conditions.

### Climate Change

The earth’s climate is predicted to change because human activities are altering the chemical composition of the atmosphere through the buildup of greenhouse gases. Although there is uncertainty about exactly how the climate will respond to the increased concentrations of greenhouse gases, observations indicate that detectable changes are already occurring. There will most likely be increases in temperature and changes in precipitation, soil moisture, and sea level, which will likely have adverse effects on many ecological systems as well as on human health and economy.

Future management decisions must consider the climate's influence on water resources. These resources are affected by changes in temperature, humidity, wind, and sunshine as well as changes in precipitation. For example, changes in streamflow tend to magnify changes in precipitation. Because evaporation from streams and lakes is likely to increase with warmer climate, it could result in lower river flow and lower lake levels, particularly in the summer. In addition, there is also a predicted trend toward fewer, but more intense rainfall events, which in turn could lead to both increased droughts and increased flooding. Groundwater supplies could also be reduced if streamflow and lake levels drop. This increasing variability must be considered in water resource planning for the future.

## **Impacts of Flooding**

The impacts of flooding in Dane County are far ranging. Specific examples of how floods negatively impact Dane County are summarized below:

- Floods cause damage to private property that often creates financial hardship for individuals and families;
- Floods cause damage to public infrastructure resulting in increased public expenditures and demand for tax dollars;
- Floods cause loss of personal income for agricultural producers that experience flood damages;
- Floods cause loss of income to businesses relying on recreational uses of County waterways;
- Floods cause emotional distress on individuals and families; and
- Floods can cause injury and death.

### Residential Flooding

Flooding of residential structures in Dane County is a major concern. This type of flooding has several causes: river flooding, high lake levels, sewer backups, stormwater runoff from urban areas as well as farmland, and high groundwater. Effects include flooded basements and first floor flooding. Combinations of these elements have damaged many structures and put even greater numbers at risk.

### Building Damage

In terms of the number of people affected and total economic loss, damage to buildings, especially residences is usually the County's largest single flood problem. Due to the relatively shallow flood depths, soaking causes the most common type of damage inflicted by a flood. When soaked, many materials change their composition or shape. Wet wood will swell and, if dried too quickly, will crack, split or warp. Plywood can break apart. Gypsum drywall will fall apart if it is bumped before it dries out. The longer these materials are wet, the more moisture, sediment and pollutants they will absorb. Walls present a special problem: a "wicking" effect pulls water up through wood and wallboard, soaking materials several feet above the actual high-water line.

Soaking can also cause extensive damage to household goods. Wooden furniture may become so badly warped that it cannot be used. Other furnishings such as upholstery,

carpeting, mattresses, and books usually are not worth drying out and restoring. Electrical appliances and gasoline engines will not work safely until they are professionally dried and cleaned. In short, while a building may look sound and unharmed after a flood, the waters can cause a lot of damage. To properly clean a flooded building, the walls and floors should be stripped, cleaned, and allowed to dry before being recovered. This is expensive and can take weeks.

Structural damage to buildings has not been a common problem.

#### Sewer and Wastewater

Sewer and wastewater service and infrastructure are compromised during flooding events in many locations around the County with consequences for homes. Sewer backups in residential basements are the primary result of overtaxed wastewater systems. Survey respondents reported 100s of residences that have had sewer backup problems. During major storm events, flows to the treatment plants increase, in some cases up to three times the normal flow due to water infiltration into the piping system. Failing pumps, and inflow meter damage, are also a problem.

#### Farmland Flooding

Dane County is the one of the most fertile counties in the State, and as a result farming plays a major role in the local economy. Flooding of farm fields and crop loss is an additional stress on an already highly stressed profession. The amount of crop loss in the County per acre varies across the landscape depending upon the topography—generally the more flat the land the more pervasive the problem. The east side of the County experiences relatively severe crop losses on occasion and the west side of the County, though not without this impact is less affected. Preparing for potential crop loss is difficult. Crop loss is capricious—timing of storms, duration of standing water, and type of crops play a part. Prolonged flooding occurring while crops are immature can lead to total crop loss for a year. Corn, for instance, has difficulty withstanding flooded soil. Flooding of short duration or later in the growing season may have little or no effect on the harvest.

Over the past decade, floods have caused crop losses throughout the County, with the Upper Sugar River watershed being the most heavily affected. Total acres affected by flooding reported through surveys approaches 5,500 acres and losses are in the 10's of millions of dollars over the last decade. The owners of approximately 55 different parcels of land have filed for flood insurance claims countywide.

#### Health and Safety

There is very little available data on health problems caused by flooding in Dane County. While such things are generally not reported, three general types of health problems accompany floods. The first comes from the water itself. Floodwaters carry whatever was on the ground that the upstream runoff picked up, including dirt, oil, animal waste, and lawn, farm and industrial chemicals. Pastures and areas where cattle and hogs are kept can contribute polluted waters to the receiving streams and groundwater supplies.

Floodwaters saturate the ground, which can lead to infiltration into sanitary sewer lines. When wastewater treatment plants exceed capacity, there is nowhere for the sewage to flow. Infiltration and lack of treatment lead to overloaded sewer lines that can back up into low lying areas and homes. Even though diluted by floodwaters, raw sewage can be a breeding ground for bacteria, such as e. coli, and other disease causing agents.

The second type of health problem comes after the water is gone. Stagnant pools become breeding grounds for mosquitoes, and wet areas of a building that have not been cleaned breed mold and mildew. A building that is not thoroughly and properly cleaned becomes a health hazard, especially for small children and the elderly. Another health hazard occurs when heating ducts in a forced-air system are not properly cleaned after inundation. When the furnace or air conditioner is turned on, the sediments left in the ducts are circulated throughout the building and breathed by the occupants.

The third problem is the long-term psychological impact of having been through a flood and seeing one's home damaged and irreplaceable keepsakes destroyed. The cost and labor needed to repair a flood-damaged home puts a severe strain on people, especially the unprepared and uninsured. There is also a long-term problem for those who know that their homes can be flooded again. The resulting stress on flooded residents takes its toll in the form of aggravated physical and mental health problems.

#### Conflicts and Complicating Factors

Simply describing flooding problems and concerns in terms of the physical environment and the resulting impacts is not sufficient for a complete understanding of the issue. Political, social, economic interests shape public views and perceptions of the problem. Any discussion regarding flood management has to take into account the fact that there are disagreements about the true nature of the issue and the associated problems. The Plan describes these factors and the types of conflicts that were observed.

## **Recommendations**

There are five basic elements of the County's strategy to reduce flood losses: mitigation, response, prevention, coordination, and education. These elements fall into two broad categories, 1) mitigation and response are aimed at reducing the impact of flooding on existing structures and facilities and 2) prevention, coordination, and education are intended to avoid increasing problems or creating new flood hazards.

Results from the public input process show that citizens that participated in the meetings value preventative measures and favor voluntary prevention programs. There is citizen support for tackling flooding on all fronts (mitigation, response, prevention, coordination, and education) though some strategies are expected to be more effective than others, such as prevention and coordination. Mitigation activities show a higher degree of acceptance when programs are voluntary and coupled with other strategies. Response measures, though they address the symptoms of flooding as opposed to the causes are also expected by citizens to be a part of the Plan. Coordination, though not a mutually exclusive strategy, attracted some attention as an important strategy for implementation as citizens look to the County to

coordinate comprehensive solutions to problems. Education was acknowledged as an important piece to the Plan, but limited in its ability to make change.

The recommendations in this section are described in terms of Goals, Policies, and Objectives. For the purposes of the Plan, the following definitions have been used:

- Goal – The purpose or end that provides direction for community decisions.
- Policy – Rules that guide the actions of the community.
- Objective – Specific, attainable, and measurable statements of the actions the community will take to carry out the Plan.

A plan is of little value if there is no means for ensuring that it is carried out. Therefore, for each objective, the Plan identifies the lead implementing agency, the basic steps to be taken to accomplish that objective, a timeline, and possible funding sources. Background information and rationale for the recommendations are also detailed in the Plan.

The goals, policies, and objectives in this section are not ordered by priority. The objectives are summarized in a table at the end of this section.

### Goal #1: Mitigation

Minimize the impact of flooding on existing structures on public and private land.

- **Policy**

Dane County should provide an opportunity for homeowners to take advantage of state and federal flood mitigation funding to decrease their risk to flooding.

Based on a preliminary analysis, there are upwards of 800 structures located in the mapped floodplains of Dane County. Damage to residences has been significant in past flood events and losses appear to be increasing. The trend can be expected to continue unless those structures are protected in some way. Recognizing that flooding to some extent is inevitable, measures can be taken to minimize the losses when flooding does occur.

There are a variety of protective measures available to homeowners. All of these options have advantages and disadvantages that have to be weighed against the risks and cost of undertaking the effort. The property owner would normally implement these protective measures, although in many cases, government agencies can provide technical and financial assistance. Dane County's role in this process is as a facilitating and coordinating entity. The County can assist in identifying and prioritizing structures at risk, recommending appropriate protective actions, identifying potential funding sources, and coordinating grant applications.

Protective measures include:

- Building acquisition and/or relocation;
- Building elevation;
- Flood barriers;

- Wet and dry floodproofing; and
- Sewer backflow prevention;
- Flood insurance.

**Objective 1**

Implement a voluntary program of property acquisition and relocation for high-risk residences.

**Objective 2**

Implement a voluntary program of flood protection for high-risk residences.

- **Policy**

Dane County should take steps to reduce flood damage to roadways and drainage structures and maintain emergency vehicle access to all residences.

Flood impact on rural roads is a common problem in Dane County. Forty percent of sites reported by survey respondents indicated that flooding in their jurisdiction included flooding of roadways. Following the presidential disaster declarations of 1993 and 2000, a high percentage of Public Assistance funding made available to rural townships was for repair and rebuilding of roads.

There are two primary impacts associated with town road and County highway flooding. Repairing washed out roads costs local governments money. And flooded roads present a hazard to public safety. Water over roads is dangerous to motorists and if it is deep enough can cause areas to become isolated and inaccessible to emergency response vehicles.

Problems with roads are just one symptom of a systematic problem. In some cases, elevating a road to protect it from flooding can cause water to dam up behind it, exacerbating the upstream problem. In other cases, installing larger culverts can cause increased flow, which if unmitigated, can exacerbate downstream problems.

Other contributing factors to these problems include the lack of systematic ditch maintenance policies and funding, roads located in low lying or inherently wet areas, improperly sized culverts, and inconsistent coordination with planners and developers when designing water conveyance structures across or next to rural roads.

**Objective 3**

Determine the feasibility of reducing the flow of floodwaters over roads by evaluating road elevation and culvert sizing standards for construction and upgrade for all County roads, but especially for roads in low lying or flood prone areas.

**Objective 4**

Develop road shoulder, ditch, and bridge maintenance and upgrade standards to prevent floodwater and stormwater from damaging or washing-out roads and making them impassible.

**Objective 5**

Formalize a process for considering water flow along and under roadways as one component of the overall water conveyance system.

**Goal #2: Response**

Improve Dane County's ability to respond to flooding and minimize the impact when flooding does occur.

- **Policy**

Improve the flood-fighting response capabilities of Dane County and local units of government.

There are a great number of actions that communities can take to reduce damages when flooding occurs, but these efforts must be coordinated and well planned to be effective.

Typical components of a flood response plan include:

- Warning the public;
- Activating an emergency operations center;
- Closing streets or bridges;
- Shutting off power to threatened areas;
- Filling and placing sandbags or other flood barriers;
- Monitoring water levels;
- Providing security and other protection measures;
- Assisting cleanup and recovery;
- Providing information to the public.

An emergency action plan ensures that all bases are covered and that the response activities are appropriate for the expected threat. These plans should be developed in coordination with the agencies or offices that are given various responsibilities.

Emergency response plans should be updated annually to keep contact names and telephone numbers current and to make sure that supplies and equipment that will be needed are still available. They should be critiqued and revised after disasters and exercises to take advantage of the lessons learned and changing conditions. The end result is a coordinated effort implemented by people who have experience working together so that available resources will be used in the most efficient manner.

**Objective 6**

Assist local units of government in developing local flood response action plans.

**Objective 7**

Improve the flood warning system for areas of the County where floodwaters rise rapidly or impact large numbers of people.

**Objective 8**

Improve the communication system between the County and local units of government when floods occur or are likely to occur.

**Goal #3: Prevention**

Minimize the potential for increasing flooding and flood-related problems within Dane County and in areas affected by Dane County drainage.

- **Policy**

Address flooding as a significant component of the County's comprehensive plan.

The County's comprehensive planning process has the potential to be a very powerful tool in preventing the flood problem from increasing. Comprehensive planning is just beginning. Workgroups have been organized and held initial meetings in July and August of 2003. The comprehensive planning process is intended to guide planning and development efforts in the County and to ensure that growth and land-use decisions are consistent with the Plan. There are nine planning elements that will be addressed in the County's plan. These are:

- Issues and Opportunities;
- Housing;
- Transportation;
- Utilities and Community Facilities;
- Agricultural, Natural, and Cultural Resources;
- Economic Development;
- Intergovernmental Coordination;
- Land Use;
- Implementation.

In one way or another, flooding and flood mitigation issues are related to every one of these planning elements. Many aspects of flooding and flood management are interconnected and cannot be addressed as though they exist in a vacuum. There are links with groundwater issues, water quality issues, habitat protection, land use, economic development, recreational use, disaster preparedness, and stormwater management.

The County should better integrate flood management and overall water management considerations into the land use and development plans. Comprehensive plans should consider the entire watershed and address multiple community issues and concerns. Included in this effort should be the development and adoption of better methods of quantifying the economic benefits of natural and cultural resources.

**Objective 9**

Develop comprehensive water management policies for Dane County, considering the connections between land-use, urban growth, and surface water, and ground water issues.

**Objective 10**

Discuss formation of a policy that guides or further restricts development around flood prone areas and areas of high flood mitigation value; support policy consistencies between the comprehensive plan and the flood mitigation plan. Lands of potential flood mitigation value are wetlands, floodplain corridors, upland storage, closed depressional basins, and areas of high infiltration potential.

**Objective 11**

Discuss urban development around small closed depressional basins that addresses special flooding and stormwater related issues that are unique to these areas.

- **Policy**

- Improve regional stormwater management practices to minimize localized flooding.

While they are closely related, stormwater management and flood management are not the same. Flood management means dealing with or preventing the problems presented when streamflows exceed stream capacities and floodwaters move out of the stream channel and lake banks due to excessive volume. Stormwater management deals with the ability of stormwater runoff to reach the stream channels of the watershed without local ponding and street, yard, and basement flooding due to increased flow rate.

To prevent exacerbating flood problems, stormwater management systems must be coordinated within the watershed. This is important because the flood elevations along the major stream channels will determine the configuration, sizing, and performance of the local drainage systems. Coordination is needed to reduce the cumulative downstream impacts of numerous drainage systems.

In general, the survey and other data indicated that additional County regulation would not be viewed favorably as a means to address flood problems. The discussion of the Focus Group, however, did identify one condition under which new or strengthened regulation would be acceptable. The Focus Group almost uniformly agreed that regional stormwater management is an area where Dane County has a coordinating role and responsibility and additional regulation would be viewed positively. This is true if and only if certain criteria are met.

- The provisions of the regulation would have to be logically and reasonably designed to address a specific problem;
- The rules would have to be applied and enforced uniformly and fairly across all levels of government;
- The County budget allocation for staff to administer and enforce the rules would have to be at a level adequate to assure compliance.

### **Objective 12**

Assist in the development of watershed-scale stormwater management plans that make possible coordinated management of locally-derived runoff.

### **Objective 13**

Evaluate the County's and other units of governments' erosion control and stormwater management, floodplain zoning, and shoreland zoning ordinances, and NFIP status to determine regulatory deficiencies, necessary improvements, enforcement shortcomings in order to bring governments into compliance and to strengthen and maximize the benefits of current regulations.

- **Policy**

Identify, conserve, and restore land of potential flood mitigation value. Lands of potential flood mitigation value are wetlands, floodplain corridors, upland storage, closed depressional basins, and areas of high infiltration potential.

Keeping floodprone areas open and free from development is the best approach to preventing flood damage. Preserving open space is beneficial to the public in many ways. Preserving floodplains, wetlands, and natural water storage areas helps maintain the existing stormwater storage capacities of an area. These sites can also serve as recreational areas, greenway corridors, provide habitat for local flora and fauna, and protect water quality.

Open space preservation should not be limited to floodplains, as some upland areas within a watershed may be key to limiting runoff that will worsen flooding problems in adjacent or downstream lowlands. A significant increase in runoff from surrounding uplands will raise the base flood elevation and enlarge the floodplain boundary. Therefore, the amount of land maintained as open space will directly affect the level of flood hazard.

### **Objective 14**

Identify and map areas in the County that have potential flood mitigation value.

### **Objective 15**

Establish flood mitigation as a criterion for land acquisition and environmental restoration where it would aid in the achievement of flood-reduction goals and conserve and restore land that meets the criteria.

- **Policy**

Manage the Yahara River and Chain of Lakes as an integrated system to minimize flood risk.

Flood management cannot be effectively addressed as a single, isolated issue. The rivers and lakes of the County are integrated within a complex hydrologic system, which is in turn integrated with just about every aspect of human development.

While all of the recommendations in the Plan have countywide application, there is one area that requires special attention, the Yahara River and chain of lakes. There have been numerous studies and reports in recent years regarding the lake levels and the management issues surrounding them. It is a highly complex system and there are a multitude of conflicting interests regarding the appropriate levels of the lakes.

The following objectives, 16 through 19 deal strictly with the issues of flooding in the Yahara River and the chain of lakes. These objectives stem from recommendations made by the Yahara Lakes Advisory Group and from conclusions drawn by the planning committee. The implementation strategy has not been fully developed. There are political issues that must be resolved before these recommendations can move forward. Achieving these objectives will require a significant political will and a financial commitment from the County. Once the will has been established, a strategy can be developed.

**Objective 16**

Ensure that the Department of Natural Resources affords flood risk as high priority when evaluating the public interest in the lake level orders for the Yahara chain of lakes.

**Objective 17**

Maintain the levels of the Yahara lakes at the lower limit of the DNR's set operating range as part of a comprehensive strategy that addresses flood risk and the needs of fisheries, recreational interests, agricultural interests and lakeshore property owners.

**Objective 18**

Develop a coordinated management strategy and a unified plan of operation and maintenance for all control structures on the Yahara River from Tenney Dam to the Stebbinsville Dam. Assure that the responsible agency has the technical expertise and resources to operate and maintain the control structures within the parameters of the Plan.

**Objective 19**

Improve monitoring and modeling of the Yahara River and chain of lakes to develop a better understanding of how the system can be more effectively managed. Include a study of the likelihood and potential impact of a significant weather event to cause Lake Mendota to rise over the top of Tenney Dam.

- **Policy**

The County should facilitate programs to clear and maintain drainage channels to decrease flooding.

By modifying channel conveyance, more water is carried away at a faster rate. Modifications generally include making a channel wider, deeper, smoother or straighter. Siltation and debris in streams and ditches was cited as a significant problem in the flood mitigation plan survey. Options available include:

- Dredging to remove silt and other debris;
- Stream straightening or widening;
- Constructing diversion channels that send floodwaters to a different location;
- Cleaning out streams to remove debris such as undesirable vegetation, garbage and downed trees.

Each of these options has advantages and disadvantages that have to be weighed against the flood risk and the impact on the environment. Because modifications of this kind convey water faster to other locations, they are appropriate only for small local problems where the receiving stream or river has sufficient capacity to handle the additional volume and flow of water.

To minimize the downstream impacts, channel modifications should be utilized in conjunction with a range of other techniques, recognizing the function of the entire system. A combination of restored wetland detention, vegetated swales, infiltration trenches and management practices that increase infiltration (reducing runoff), and improve water quality can be implemented in conjunction with stormwater system improvements. These types of projects can have multiple benefits.

### **Objective 20**

Evaluate methods such as modification of bridge constrictions, aquatic plant removal, dredging, and channel modifications to increase flow conveyance, while respecting in-stream natural and cultural resources.

### **Goal #4: Coordination**

Facilitate and coordinate solutions to multi-jurisdictional issues that involve government, citizens, stakeholders, and policy-makers at all levels.

- **Policy**

Facilitate multi-jurisdictional, high priority flood project activities involving stakeholders, and incorporated and unincorporated units of government where they are consistent with the goals and policies of the Flood Mitigation Plan.

In any planning process, boundaries have to be drawn to define the scope of the effort. Conceivably, planning for flood management and stormwater management could be based on areas defined by new subdivisions, governmental jurisdictions, or watersheds. There are important reasons for watershed level planning where possible:

- A watershed is a natural description of the area of land that drains into a lake, stream, or other body of water. The term describes an interconnected system of water conveyance. Municipal borders or other political jurisdictions may coincide with some of these natural features, but their boundaries are artificial. The flow of water does not respect these boundaries.
- Flood management and stormwater management should form a single integrated system over the entire watershed. The streams and waterways of a watershed must be capable of carrying present and future runoff loads generated by all of the existing and future planned development patterns within the watershed. Development patterns and land use are not controlled by watershed factors, but can and do have major effects on watershed problems. Land use changes and water management practices upstream can have significant impacts on downstream areas. In many cases part of the solution to a downstream problem may be found in changes to the way water is managed upstream.
- Many “Friends” or constituency groups or other associations are organized on a watershed basis. There is a potential to partner on projects with these groups if the effort is designed to benefit the entire watershed.

The County is uniquely situated to coordinate and facilitate projects on a watershed level. In fact, facilitating multi-jurisdictional efforts was identified in the public input process as one of the primary roles of the County. Many of the ideas expressed in other recommendations of the Plan assume the role of the County as a facilitating agent. This policy makes that assumption explicit.

**Objective 21**

Identify hot spots or high priority projects involving multiple jurisdictions where watershed level solutions could be applied.

**Objective 22**

Coordinate funding opportunities to carry out the objectives of the flood mitigation plan including, but not limited to mitigation, land acquisition, regional projects, and flood response activities.

**Goal #5: Education**

Gather and disseminate information about issues and processes associated with flood management in Dane County.

- **Policy**

Facilitate the use of existing tools and develop new education tools to inform local officials, developers, property owners, and other stakeholders about preventing, mitigating, and responding to floods, taking advantage of flood events as an opportunity to get the word out.

Effective flood management can only be achieved if people are well educated on the issues and how they are related. Members of the public, political leaders, professionals, developers, etc. have to understand the implications of the decisions they are making. Good decision-making implies that people have good, accurate information on which to base those decisions.

**Objective 23**

Launch and update when necessary, an educational program to provide local units of government with important flood-fighting information.

**Objective 24**

Improve citizen and local elected officials understanding of floodplain maps and floodplain regulations, floodproofing options, development and stormwater management considerations, and other information to assist in good decision-making.

**Objective 25**

Develop and use a flood risk map based on hydric soils, wetlands, and areas of past damage. Consider incorporating a buffer area of 1 foot in elevation above the mapped 100-year floodplain on FIRM maps as an advisory tool. Use the map as an educational tool, and also share with real estate agents and local units of government.

- **Policy**

Support a systematic update of FEMA's Flood Insurance Rate Maps (FIRM) for Dane County, including consideration of future conditions development and hydrology.

Where possible, floodplain maps should be based on future conditions hydrology. Historically, flood hazard information presented on Flood Insurance Rate Maps has been based on the existing conditions of the floodplain and watershed. When the mapping of flood hazards was initiated under the National Flood Insurance Program (NFIP), the intent of the program was to reassess each community's flood hazards periodically and, if needed, revise the FIRM maps. Flood hazards may change significantly in areas experiencing urban growth or changes in physical conditions caused by such geologic processes as subsidence and erosion.

The different uses of FEMA's flood hazard maps should be considered if floodplains based on future-conditions hydrology are to be used. Currently, two of the primary uses of the flood hazard maps are floodplain management and flood insurance rating.

From a floodplain management standpoint, future-conditions floodplains can be used to develop a more stringent floodplain management policy than required by FEMA. By displaying future-conditions floodplains on FEMA maps, the County would be alerting the public that flood hazards may increase in the future due to urban development.

The current procedure for flood insurance rating is that structures shown within the existing-conditions 1-percent-annual-chance (100-year) floodplain are subject to a mandatory purchase requirement. Due to statutory constraints, FEMA can not use future-conditions data for flood insurance purposes. **Therefore, FEMA will continue to use existing-conditions data to establish flood insurance rates.**

The implementation strategy for this recommendation has not been developed. There are some significant political issues that must be resolved before this recommendation can move forward. Achieving this objective will require a significant political will and a financial commitment from the County as well as local units of government. Once the will has been established, a strategy can be developed.

<b>Summary of Plan Objectives</b>			
<b>Objective</b>		<b>Priority</b>	<b>Lead County Agency</b>
<b>Goal 1: Mitigation</b>			
1.	Implement a voluntary program of property acquisition and relocation for high-risk residences.	High	Emergency Management
2.	Implement a voluntary program of flood protection for high-risk residences.	High	Emergency Management
3.	Determine the feasibility of reducing the flow of floodwaters over roads by evaluating road elevation and culvert sizing standards for construction and upgrade for all County roads, but especially for roads in low lying or flood prone areas.	Moderate-Low	Highway and Transportation
4.	Develop road shoulder, ditch, and bridge maintenance and upgrade standards to prevent floodwater and stormwater from damaging or washing-out roads and making them impassible.	Moderate-Low	Highway and Transportation
5.	Formalize a process for considering water flow along and under roadways as one component of the overall water conveyance system.	Moderate	Highway and Transportation
<b>Goal 2: Response</b>			
6.	Assist local units of government in developing local flood response action plans.	High	Emergency Management

7.	Improve the flood warning system for areas of the County where floodwaters rise rapidly or impact large numbers of people.	High	Emergency Management
8.	Improve the communication system between the County and local units of government when floods occur or are likely to occur.	Moderate	Emergency Management
<b>Goal 3: Prevention</b>			
9.	Develop comprehensive water management policies for Dane County, considering the connections between land-use, urban growth, and surface water, and ground water issues.	High	Planning and Development
10.	Discuss formation of a policy that guides or further restricts development around flood prone areas and areas of high flood mitigation value; support policy consistencies between the comprehensive plan and the flood mitigation plan. Lands of potential flood mitigation value are wetlands, floodplain corridors, upland storage, closed depressional basins, and areas of high infiltration potential.	High	Planning and Development
11.	Discuss urban development around small closed depressional basins that addresses special flooding and stormwater related issues that are unique to these areas.	High	Planning and Development
12.	Assist in the development of watershed-scale stormwater management plans that make possible coordinated management of locally-derived runoff.	Moderate	Land Conservation
13.	Evaluate the County's and other units of governments' erosion control and stormwater management, floodplain zoning, and shoreland zoning ordinances, and NFIP status to determine regulatory deficiencies, necessary improvements, enforcement shortcomings in order to bring governments into compliance and to strengthen and maximize the benefits of current regulations.	High	Planning and Development
14.	Identify and map areas in the County that have potential flood mitigation value.	High	Land Conservation
15.	Establish flood mitigation as a criterion for land acquisition and environmental restoration where it would aid in the achievement of flood-reduction goals and conserve and restore land that meets the criteria.	High	Parks

16.	Ensure that the Department of Natural Resources affords flood risk as high priority when evaluating the public interest in the lake level orders for the Yahara chain of lakes.	Not Assigned	County Executive/ County Board
17.	Maintain the levels of the Yahara lakes at the lower limit of the DNR's set operating range as part of a comprehensive strategy that addresses flood risk and the needs of fisheries, recreational interests, agricultural interests and lakeshore property owners.	Not Assigned	County Executive/ County Board
18.	Develop a coordinated management strategy and a unified plan of operation and maintenance for all control structures on the Yahara River from Tenney Dam to the Stebbinsville Dam. Assure that the responsible agency has the technical expertise and resources to operate and maintain the control structures within the parameters of the plan.	Not Assigned	County Executive/ County Board
19.	Improve monitoring and modeling of the Yahara River and chain of lakes to develop a better understanding of how the system can be more effectively managed. Include a study of the likelihood and potential impact of a significant weather event to cause Lake Mendota to rise over the top of Tenney Dam.	Not Assigned	County Executive/ County Board
20.	Evaluate methods such as modification of bridge constrictions, aquatic plant removal, dredging, and channel modifications to increase flow conveyance, while respecting in-stream natural and cultural resources.	Moderate	Land Conservation
<b>Goal 4: Coordination</b>			
21.	Identify hot spots or high priority projects involving multiple jurisdictions where watershed level solutions could be applied.	High	Flood Mitigation Planning Team
22.	Coordinate funding opportunities to carry out the objectives of the flood mitigation plan including, but not limited to mitigation, land acquisition, regional projects, and flood response activities.	High	Emergency Management
<b>Goal 5: Education</b>			
23.	Launch and update when necessary, and educational program to provide local units of government with important flood-fighting information.	Moderate	Emergency Management

24.	Improve citizen and local elected officials understanding of floodplain maps and floodplain regulations, floodproofing options, development and stormwater management considerations, and other information to assist in good decision-making.	Moderate	Emergency Management
25.	Develop and use a flood risk map based on hydric soils, wetlands, and areas of past damage. Consider incorporating a buffer area of 1 foot in elevation above the mapped 100-year floodplain on FIRM maps as an advisory tool. Use the map as an educational tool, and also share with real estate agents and local units of government.	Moderate	Land Information Office

## Plan Evaluation

The strategy for implementation of the Plan is outlined within the recommendations of the previous section. In addition, the Plan will require periodic evaluation to determine if revision is necessary. The County’s flood mitigation planning team will conduct an annual evaluation of the Plan. The Department of Emergency Management will lead this effort. At a minimum, the evaluation will consider the following:

- A review of the goals, policies, and objectives relative to determine whether they remain an appropriate approach to the problems they are intended to address;
- The progress of the program activities toward achieving the specific flood mitigation objectives;
- The problems encountered in the implementation of the specific activities;
- Evaluation and refinement of the specific activities based on the evaluation of the problems encountered;
- Review of possible funding sources that could be applied to future efforts;
- Review of the public input process to ensure that citizens’ concerns are heard in the implementation and evaluation process.

Following a disaster or a major flooding event, Dane County will review and update the Plan to reflect the status of current mitigation efforts; to expand the Plan as necessary; and to address new issues, recommendations, and activities based on the impacts of the current disaster.

Any substantive changes to the Plan will be presented for formal approval to the County Board, through the Lakes and Watershed Commission.

## Existing Programs and Funding Sources

There are numerous options available to Dane County for the financing of a flood mitigation program. The identification of potential funding sources, including sources other than those

at the local level is an integral part of the implementation of a successful mitigation plan. However, funding programs and opportunities are constantly changing. The Plan includes a list of existing programs and funding sources that are potentially applicable to Dane County directly or to municipalities within Dane County. It is intended that the list facilitate the implementation of the flood mitigation activities identified in the Plan.

In many cases, the listed programs and initiatives are not directly intended as flood mitigation programs. These programs do, however, have goals and objectives that are compatible with general flood mitigation goals and principles and could be applied to serve the purposes of both programs. Also, some of the programs may not be available to the County for a variety of reasons, including eligibility requirements or lack of funds in the state or federal budgets.