Village of Gurnee, Illinois
Flood Mitigation Plan
Executive Summary

Adopted December 3, 2001

Flood Mitigation Planning Committee

The Lake County Stormwater Management Commission (SMC) has initiated a program to prepare flood mitigation plans, with particular attention to reducing losses in repetitively flooded areas. Rather than use a single approach, such as a flood control project, this planning effort encourages a variety of measures, including acquisition, flood-proofing, flood warning, channel maintenance, public information, and various types of regulations for new development.

Because of Gurnee's repetitive flood history, recent mitigation activities and interest in flood loss reduction, SMC selected the Village as a pilot for a community-wide plan. SMC provided the funds and technical support and the Village provided the staff support for the preparation of this *Flood Mitigation Plan*.

For more information on the Lake County Stormwater Management Commission, call 847/918-5260

For more information on the Village of Gurnee and flood mitigation, contact Brad Burke, Assistant Village Manager, at 847/623-7650.

Flood Mitigation Plan

Executive Summary

This Executive Summary is a synopsis of the Village of Gurnee's draft *Flood Mitigation Plan*. The sections in this summary correspond to the chapters in the full *Plan*. The full *Plan* can be viewed at the Warren Newport Public Library, at Village Hall, and on the Village's web site, www.gurnee.il.us.

1. Introduction

The Village of Gurnee has several floodplains within its corporate limits, but the major flood problem is concentrated along the Des Plaines River. This area has always flooded. Recent damaging floods occurred in 1938, 1960, 1979, 1986, 1993, and 2000.

The Des Plaines' floodplain is the historical core of Gurnee. At one time, it included the original downtown businesses, the Village Hall, the Police and Fire Stations, many single family homes, the Gurnee Grade School, and the preserved house of one of the earliest settlers.

Downtown Gurnee, 1986

All the Village's efforts to mitigate flood losses have helped, but they have not eliminated all potential flooding. There are many ways to protect properties from flood damage, including floodproofing, flood warning, channel maintenance, and various types of regulations for new development.

Because of the variety of possible flood protection measures, the Village of Gurnee opted to prepare a formal *Flood Mitigation Plan*. The objective of the plan is to guide flood protection activities for the next 5 – 10 years and ensure that the Village implements flood related activities that are most effective and appropriate for the situation.

This *Flood Mitigation Plan* was developed under the guidance of a Flood Mitigation Planning Committee. A resolution was passed on June 4, 2001, by the Village Board of Trustees that formally recognized the planning process and created the Committee. The resolution named the members, ensuring that at least half of them represented residents and stakeholders for the area. The project was funded by the Lake County Stormwater Management Commission. Technical support was provided by French & Associates, Ltd., a mitigation consulting firm from Park Forest, Illinois.

2. Problem Description

Flood records: Flood levels on the Des Plaines River have been recorded on the "Gurnee Gage" since 1946. The gage measures water levels starting from an arbitrary "stage" of zero. This gage is located upstream of the Highway 120 bridge and is operated and maintained by the U.S. Geological Survey.

Records are in stage, but they can be converted to elevation above sea level. The stage of zero equates to an elevation of 650.3 feet above sea level. Water that reaches a stage of 13.0 feet at the Gurnee gage is 663.3 feet above sea level.

Highlights of historical flooding are shown in the graph to the right. The "flood of record," or highest flood in recorded history, was in September 1986.

The graph shows two 100-year or base flood levels, one for the 1980 Flood Insurance Study (FIS) and one for the 2000 FIS. The earlier study calculated the base flood elevation at the gage to be 661.5 feet above sea level. The 1986 flood was higher than the 100-year or base flood as calculated by the 1980 study.

The newer studies of the Des Plaines River have concluded that the 1980 Flood Insurance Study underestimated the true risk. The 1986 flood is now rated as approximately a 20-year flood at the Gurnee gage.

The relative depths of four floods at the Fire Station is shown in the photo on the next page. Based on the 2000 Flood Insurance Study, the base or 100-year flood elevation is 1.9 feet over the garage bay floor.

Flood Stages and Elevations
Des Plaines River Gage, Highway 120

Stage	Elevation	
	667.0	
		– 500-year flood (2000 FIS)
6.0		
	666.0	
15.0		
	665.0	
		– 100-year flood (2000 FIS)
14.0		
	664.0	– 50-year flood (2000 FIS)
13.0		
	663.0	
12.0		
	662.0	– 9/27/86 – 10-year flood (2000 FIS)
11.0		– 100-year flood (1980 FIS)
	661.0	– 7/4/38
		– 4/3/60
10.0		– 3/22/79, 6/16/2000
	660.0	– 4/22/93

Impact of flooding: Flooding of the Des Plaines River is a relatively low threat to public health and safety, although people have been killed in past floods in the area. The major hazards are driving through flooded areas and the danger of electrocution or gas leakage in flooded buildings.

Approximate flood depths at the Fire Station

The 100- and 500-year flood levels are according to the 2000 Flood Insurance Study.

In June, 2001, a building by building field survey was conducted. Eleven "clusters" of similarly situated buildings were identified. Their general locations are shown on the map on the next page and their data are summarized below.

The table and map show that commercial properties are concentrated along Old Grand Avenue in three clusters, West Grand, Downtown and East Old Grand. Residences are in Kilbourne/Emerald, East Old Grand and all five clusters south of Grand. The industrial properties are on Grove Avenue.

Planning Area Clusters

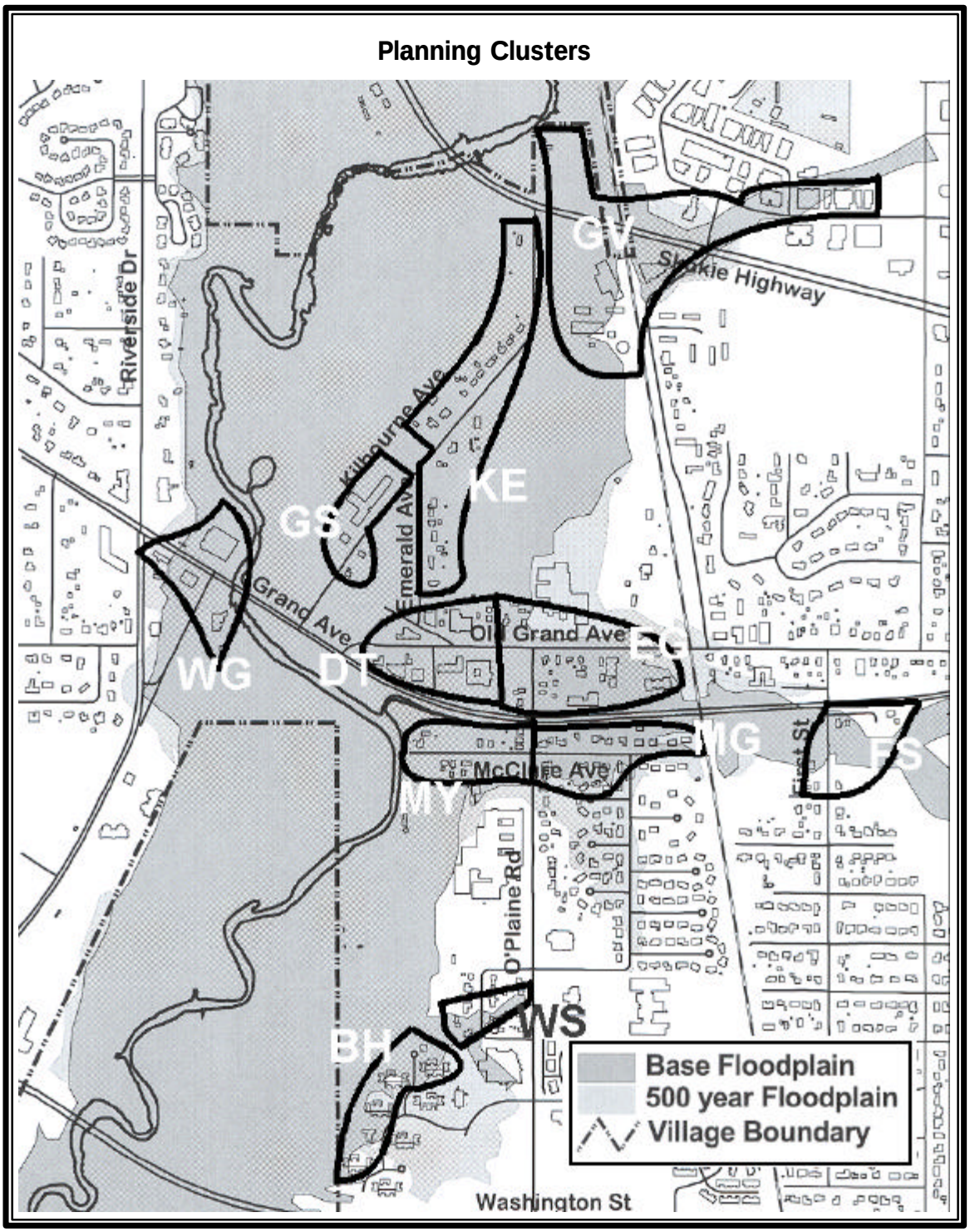
Cluster	Residential (1)		Non-Residential			Total
	Single-family	Multi-family	Com-mercial	Indus-trial	Public (2)	
GV – Grove			2	6	2	10
WG – West Grand			3		1	4
GS – Grade School					3	3
KE – Kilbourne/Emerald	20					20
DT – Downtown			9		4	13
EG – East Old Grand	8		7		1	16
MY – McClure Floodway	6	3				9
MG – McClure Fringe	13	7				20
FS – First Street	5					5
WS – West Street	5					5
BH – Brookhaven		5	1			6
Total	57	15	22	6	11	111

Parcels not in these 11 clusters are publicly owned vacant lands.

Notes: (1) The single-family residence category Includes duplexes.
(2) The public category includes private, non-profit facilities.

The three major factors in damage to buildings are flood depth, velocity, and duration. Velocities are relatively low, less than one foot per second. Duration can vary from flood to flood, but floodwater will stay longer in the lower buildings. Therefore, in Gurnee, the key determinant of flood damage to buildings is flood depth.

The area subject to the greatest flood depth is the Downtown cluster, where the base flood will be three feet or deeper over the first floor in 7 out of 13 buildings (54%). The residential clusters most exposed to flood damage are Brookhaven, Kilbourne/ Emerald and McClure Floodway where the base flood is over the first floors of 100%, 90% and 67% of the homes, respectively. The homes in the First Street cluster are in the flood-plain, but all of their first floors are above the base flood elevation.



Critical facilities: The following locations were determined to be vital to the flood response and recovery effort or if flooded would create secondary disasters:

- Fire Station #1
- Police Station
- Public Works complex
- Water pumping station
- Dada's dry cleaning
- Bass Pro
- Marathon gas station
- North Shore Sanitary District treatment plant
- Warren Township High School
- Gurnee Grade School
- Viking School
- U.S. Highway 41/Skokie Highway bridge
- State Route 132/Grand Avenue bridge
- Washington Street bridge

Economic impact: Businesses can be hard hit by a flood which damages structures and inventories and stops sales and revenues for weeks. All properties are hit with higher taxes to cover repairs and flood protection. Flood repairs and reconstruction of Gurnee Grade and Viking Schools cost $17 million in property taxes.

Skokie Highway, 1986 flood

The Village is split in two when the Des Plaines River bridges are closed, costing over $383,000 each day in additional transportation costs in Gurnee alone.

Natural and beneficial floodplain functions: When portions of floodplains are preserved in their natural state, or restored to it, they provide many benefits to both human and natural systems. Some are static conditions—such as providing aesthetic pleasure—and some are active processes, such as reducing the number and severity of floods, helping handle stormwater runoff and minimizing non-point water pollution. Luckily, much of the Des Plaines River floodplain is in wetlands and is kept open through public ownership, much of it belonging to the Forest Preserve District.

Other natural hazards: The Village's Emergency Operations Plan and the Illinois Emergency Management Agency's Hazard Mitigation Plan identify other natural and technological hazards that can occur in Gurnee. The natural hazard with the highest risk is tornado. Those with moderate risk are drought/heat, earthquake, winter storms, severe thunderstorms (and lightning and resultant local flash flooding problems), excessive heat and excessive cold. A screening of key buildings identified one at high risk to damage by an earthquake. All of these natural hazards can occur anywhere in the Village and were considered during the planning process.

Future trends: Forecasts project an 80% increase in households and a 66% increase in population in the Illinois portion of the Des Plaines River watershed. If land continues to be developed as it has in the past with little attention given to the amount of impervious surface, new development will almost certainly result in increased flood heights on the Des Plaines River.

3. Goals

The Mitigation Planning Committee conducted several exercises to reach a consensus on the goals for mitigation planning. These brought out members' concerns about the planning area and the problems residents and businesses face. They also identified the strong points about the area and the community that should be preserved and built on.
Four overall goals were set for the mitigation effort:

1. Protect existing properties
2. Protect health and safety
3. Improve the quality of life in Gurnee.
4. Ensure that public funds are used in the most efficient manner.

4. Preventive Measures

The Planning Committee looked at measures that are designed to keep the problem from occurring or getting worse by preserving areas from development and by setting construction standards for new development. The Committee concluded:

– The *Comprehensive Plan* and zoning ordinance are relatively consistent with the current designation of land uses in the Des Plaines River floodplain. They support the status quo, which means little new floodplain development.

– There are opportunities for improving the Des Plaines River floodplain, especially as a recreational asset. However, the "Village Center" and capital improvement plans deserve special attention as they call for improving and preserving development in the area of deepest flooding.

Des Plaines River Forest Preserves are excellent examples of a preventive measure that keeps the floodplain open and serves the entire community.

– The Village's building code, floodplain development and stormwater management regulations exceed minimum national and State standards and will be effective in preventing flood problems from increasing.

– The Village's building code and other preventive measures are appropriate for the hazards expected from earthquakes, heat, drought, winter storms and thunderstorms.

– The official regulatory map is not yet in the Village's geographic information system (GIS) and that map and the GIS contour map have conflicting information on where the floodplain boundary should be.

5. Property Protection

Property protection measures are used to modify buildings subject to flood damage rather than to keep floodwaters away. These can be inexpensive measures which often are implemented by or cost-shared with property owners. They include relocation, acquisition, local barriers, floodproofing and insurance. The Committee found:

– There are several ways to protect individual properties from flood damage. Each is appropriate in certain situations and each has advantages and disadvantages.

– There are many ways to protect properties from other hazards. There are several measures that can protect properties from the effects of more than one hazard.

– Property owners can implement some property protection measures at little cost, especially for sites in areas of low flood hazard. For other measures, such as relocation and elevation, the owners may need financial assistance.

– Many people are not aware of the various ways they can protect their own property. There is a low level of awareness of the availability and coverage provided by flood insurance. There is probably a similar level of awareness of other hazard insurance.

This home was acquired in 2000 by the Stormwater Management Commission and the site was cleared for open space.

– Of the 111 buildings in the Des Plaines River floodplain, 20 are above the base flood elevation, 26 should be relocated, and 65 could be retrofitted in place. Forty-four properties are appropriate for acquisition or relocation.

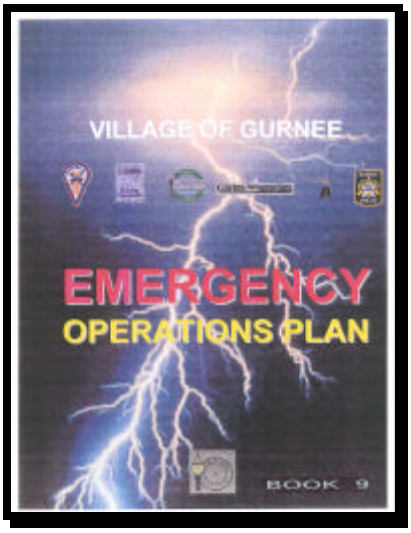
6. Emergency Services

Emergency services measures protect people during and after all types of hazards. These measures are coordinated by the Gurnee Fire Department and the Lake County Emergency Management Agency. Key findings were:

– The flood threat recognition system for the Des Plaines River works, as do the threat recognition procedures for the other quick onset hazards, such as tornadoes and storms. The warning procedures and media are effective for the hazards faced by the Village. More and redundant warnings help. Every warning should be accompanied by information on what one should do.

One of the Village's sirens

– The slow onset of flooding in the past has allowed the Village to determine and implement response activities as the flooding occurs. However, a flood stage forecast map would be very useful during flood operations and even more useful in preparing pre-flood response plans. The Village has already started to prepare one.



– The *Emergency Operations Plan* is a multi-hazard response plan and does not provide specific guidance for individual hazards. It has worked well during past disasters and emergencies. Floodprone critical facilities could use annexes to help prepare them for flooding by the Des Plaines River.

– The Emergency Operations Plan has guidance on Village recovery and reconstruction activities to be undertaken after a disaster. Detailed plans and procedures that coordinate these activities with public information activities and inspections of building repairs would better prepare the Village and property owners to quickly take advantage of post-disaster mitigation opportunities.

7. Structural Projects

Structural projects have traditionally been used by cities to control flows and water surface elevations. They include reservoirs, levees, floodwalls, channel improvements, modifying crossings and roadway, drainage and storm sewer improvements, and drainage system maintenance.

Periodic inspections and debris removal are needed to prevent dams in streams

– Major structural flood control projects on the Des Plaines River, including reservoirs, dredging, channel improvements, a diversion, bridge modifications and road raising, have been examined by the Corps of Engineers and other agencies. The consistent conclusion is that either they would not impact Gurnee or they are too expensive when compared to their flood damage reduction benefits.

– A levee along the Des Plaines River was examined, but preliminary benefit/cost analyses and the impact on flood storage ruled out Federal funding. The Village of Gurnee had additional reasons to not support such a levee.

– Local drainage flooding would benefit from drainage system improvements and a formalized drainage maintenance program. One area that deserves attention is the Kilbourne/Emerald planning cluster.

8. Natural Resource Protection

Natural resource protection activities are generally aimed at preserving (or in some cases restoring) natural areas. In so doing, these activities enable the naturally beneficial functions of floodplains and watersheds to be better realized. For example, protecting wetlands preserves areas that store and filter floodwaters.

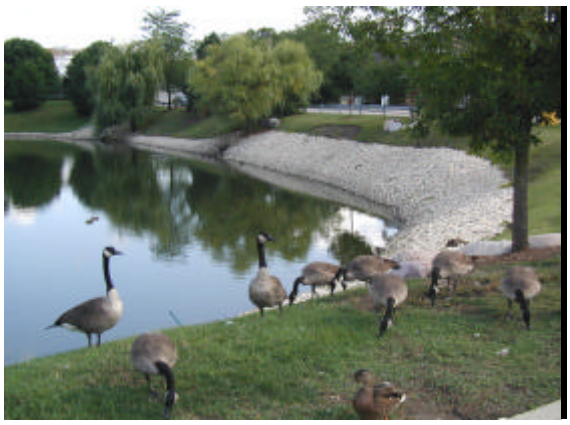
Natural resource protection measures are implemented by a variety of public and private parties ranging from local park districts, forest preserves and regulatory agencies to land developers and farmers. The Committee looked at wetland protection, erosion and sedimentation control, river restoration, best management practices, dumping regulations, and urban forestry. It concluded:

- Improving water quality and habitat, expanding open space, and improving the quality of life in Gurnee are goals of this *Plan*. Protecting natural resources, including wetlands and water quality, are important and effective measures to reach those goals.

- The current regulations on wetland protection, erosion and sediment control, and best management practices, have effective standards. However, there is a need to ensure that they are properly enforced.

- The Village does not have an ordinance that prohibits dumping in wetlands or other parts of the drainage system.

- The Village's urban forestry program can prevent and remove tree limbs that can damage utility lines during wind, snow and ice storms. The program is new, but appears to be on the right track.

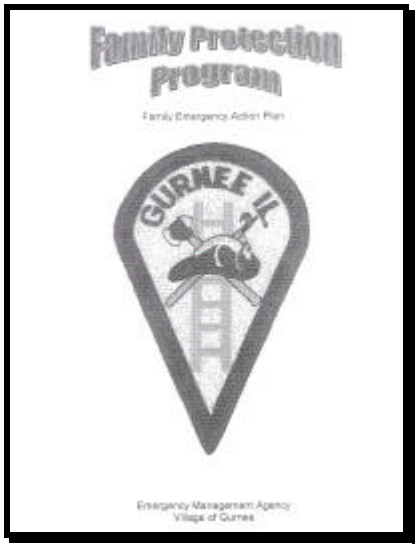


A tale of two retention basins

The basin on the left is in Libertyville. The traditional design used steep slopes and rock rip-rap to stabilize the shore line. The site is plagued with geese. The basin on the right is at the Gurnee Village Hall is an example of the "river restoration" concept. Using natural plantings provides a more attractive setting and the tall grasses have kept geese away.

9. Public Information

A successful hazard mitigation program involves both the public and private sectors. Public information activities advise property owners, renters, and businesses about flood hazards and ways to protect people and property from these hazards. These activities can motivate people to take flood protection steps and protect the natural and beneficial functions of floodplains and watersheds.



There are many ways that public information programs can be used so that people and businesses will be more aware of the hazards they face and how they can protect themselves. The Planning Committee found:

- Most public information activities can be used to advise people about all hazards, not just floods.
- Some of the public information activities can be implemented by Village staff.
- Other public information activities require coordination with other organizations, such as schools and real estate agents. There are several area organizations that can provide support for public information and educational programs.

10. Action Plan

General recommendations appear at the end of Chapters 4 – 9 for each of the six mitigation strategies. The overall directions can be summarized under four general approaches

- Implement appropriate acquisition and retrofitting measures to protect buildings from flooding by the Des Plaines River.
- Improve and administer regulations on new construction throughout the community, with special emphasis on floodplain development and protection of natural resources.
- Respond to floods and other natural hazards before they reach threatened areas.
- Inform and involve the public in the implementation of this *Plan* and in protecting their own health, safety and property.

The Action Plan converts the general recommendations and overall directions to specific action items. It is organized according to the office that would be responsible for them.

Administration Department

1. The Village should acquire floodprone properties where appropriate. All acquisition projects should be voluntary. In the Downtown area, acquired parcels should be re-used in accordance with the Village Center plans.

2. The Village should provide technical and financial support to property owners interested in retrofitting their properties to protect them from floods, sewer backup and other hazards.

Planning

3. Prepare an updated Village Center Plan to identify projects that would both improve the Village Center and reduce losses from flooding and other hazards.

Building & Zoning

4. Review the inspection and enforcement procedures for the Watershed Development and Zoning Ordinances and the Building Code to determine if changes are needed to ensure complete compliance with the Village's requirements.

5. Review the Watershed Development and Zoning Ordinances and the Building Code to determine appropriate amendment language to address simple and inexpensive property protection measures and to initiate stream and wetland dumping regulations.

Fire

6. Continue to follow the Emergency Operations Plan and critique and revise it after each emergency or disaster. Prepare an annex to the Emergency Operations Plan that uses the Flood Stage Forecast Map to identify areas affected and resources needed at various predicted flood levels.

Engineering

7. Incorporate the Digital Flood Insurance Rate Map for Lake County into the Village's geographic information system and request that the official FEMA floodplain map be revised where contours differ from the mapped floodplain boundaries.

8. Prepare a formal flood stage forecast map for the Des Plaines River floodplain.

9. Implement the drainage system inventory scheduled in the Capital Improvements Program. When completed, develop a long term drainage and storm sewer improvement plan.

Public Works

10. Prepare formal drainage system maintenance procedures that are coordinated with other agencies' maintenance programs.

Public Information

11. Ensure that the following technical information activities are implemented:

    - Stocking the Warren Newport Public Library with property protection references.
    - Links on the Village's web site to flood data, references and sources of assistance.

- A guidebook for property owners
- Site visits to advise residents and businesses on how to protect their properties

12. In cooperation with the Mitigation Committee, ensure that the following outreach projects are implemented:

    - Articles for the Village newsletter
    - An annual mailing to all floodplain properties with survey data
    - Articles and news releases
    - Educational activities for school and recreation programs

Board of Trustees

13. Adopt this *Flood Mitigation Plan* by passing a resolution that also creates a permanent Mitigation Committee.

Mitigation Committee

14. Monitor implementation of the Action Plan and report on progress and recommended changes to the Mayor and Board of Trustees.

Village Administrator

15. Submit an application for a flood insurance premium rate discount under the Community Rating System.

Action Plan Summary

Office	Action Item		Deadline	Budget
Administration	1	Acquisition Program	Ongoing	Current levels
	2	Retrofitting Support	6/30/02	$25,000/year
Planning	3	Village Center Plan	12/31/02	Staff time
Building & Zoning	4	Regulation Administration	6/30/02	Staff time
	5	Regulation Provisions	6/30/02	Staff time
Fire	6	Flood Annex	6-31-02	Staff time
Engineering	7	Floodplain Map	3/31/02	Staff time
	8	Flood Stage Forecast Map	3/31/02	Staff time
	9	Drainage Improvements	12/31/02	Staff time + $200,000
Public Works	10	Drainage Maintenance	3/31/02	Staff time
Public Information	11	Technical Information	4/30/02	Staff time
	12	Outreach Projects	4/30/02	Staff time + $1,000/yr
Board of Trustees	13	*Plan* Adoption	12/31/01	Staff time
Mitigation Committee	14	Program Oversight	Ongoing	Staff time
Village Administrator	15	Community Rating System	4/30/02	Staff time