

A Flood Mitigation Plan for the Non-Tidal, N.J. Section of the Delaware River Basin



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Delaware River Basin Commission

July 16, 2008 Commission Meeting

Overall Goal of Plan:

“To make the Delaware River Basin more disaster resilient by reducing long-term risks to loss of life and property damage from flooding.

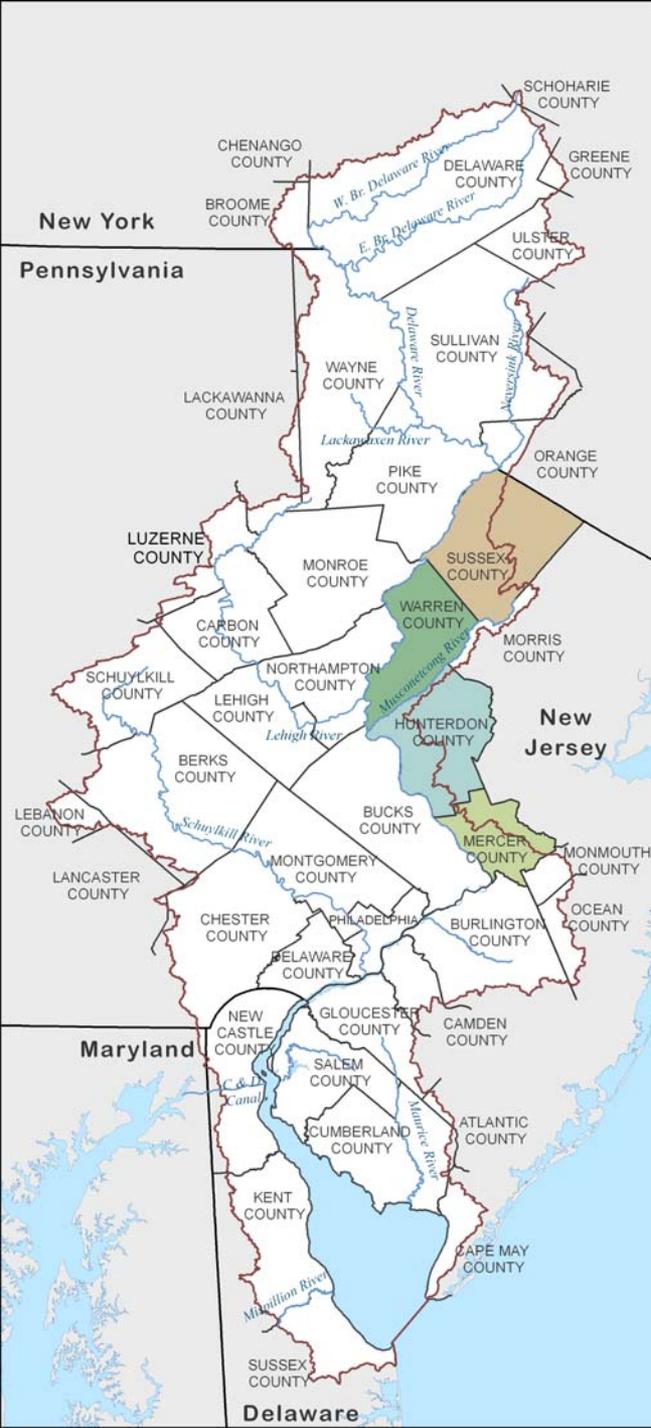


Stockton, NJ - April 2005

The aim is to empower local communities to mitigate and support a sustainable community plan so that, when confronted by a natural disaster, they will sustain fewer losses and recover more quickly.”

Key Plan Objectives:

- Increase the coordination and cooperation among intergovernmental entities for flood mitigation;
- Demonstrate a firm local commitment to flood mitigation;
- Leverage a wide array of funding opportunities to implement actions;
- Comply with federal legislative requirements for local mitigation plans; and
- Reduce future flood loss.



■ Multi-Agency and Local Partnership:

- Delaware River Basin Commission (DRBC)
- New Jersey Department of Environmental Protection (NJDEP)
- New Jersey Office of Emergency Management (NJOEM)
- County Emergency Management and Planning Departments

■ Components of a Flood Mitigation Plan:

- Planning Process
- Hazard Identification and Profiling
- Risk Assessment
- Mitigation Strategy

Planning Process

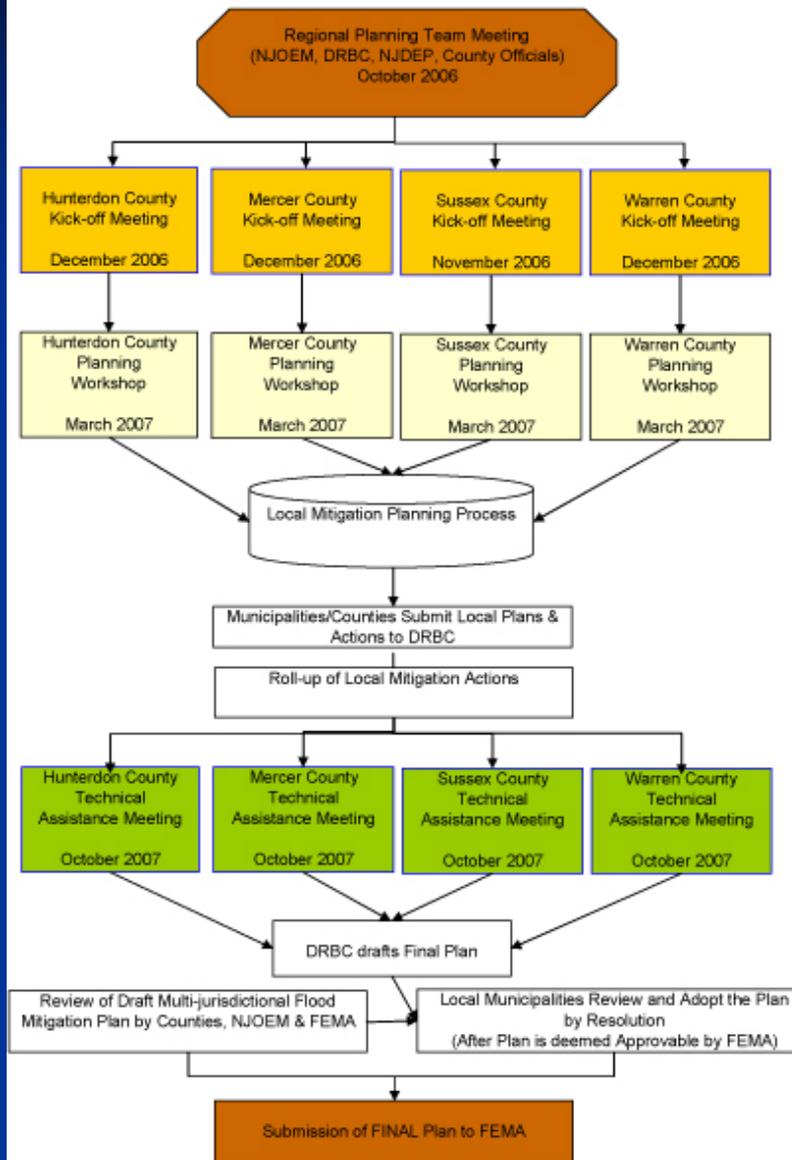


Lambertville, NJ - April 2005

- 1) Project Management Team
- 2) Regional Planning Team
- 3) Local Municipalities

A Multi-Jurisdictional Flood Mitigation Plan for the Non-Tidal N.J. Section of the Delaware River Basin

-Planning Process-



Municipal Requirements

- Submit a Statement of Intent for your municipality
- Attend county meetings (at least 2 of 3)
- Form a local mitigation planning committee
- Complete municipal questionnaire and worksheet
- Publish notice of the municipality's intent to participate
- Distribute a prepared questionnaire to residents/businesses;
- Allow time for comment at two public meetings;
- Develop a list of community flood mitigation goals
- Prioritized list of desired local mitigation actions (includes estimated costs, organization responsible for implementation, timeframe and potential funding sources)

Technical Assistance Provided

- Facilitation of three meetings per county
- DRBC project-specific website to disseminate products and planning tools
- Analysis of flood insurance claims and repetitive loss properties
- Flood hazard identification and vulnerability assessment (HAZUS)
- Essential Facility vulnerability analysis
- Land use and impervious cover change analysis
- Basin-scale mitigation strategies and priorities
- Roll-up local mitigation strategies
- Draft/compile final plan

Study Area Participation:

Hunterdon:

16 Eligible Municipalities
12 Participated

Mercer:

9 Eligible Municipalities
6 Participated

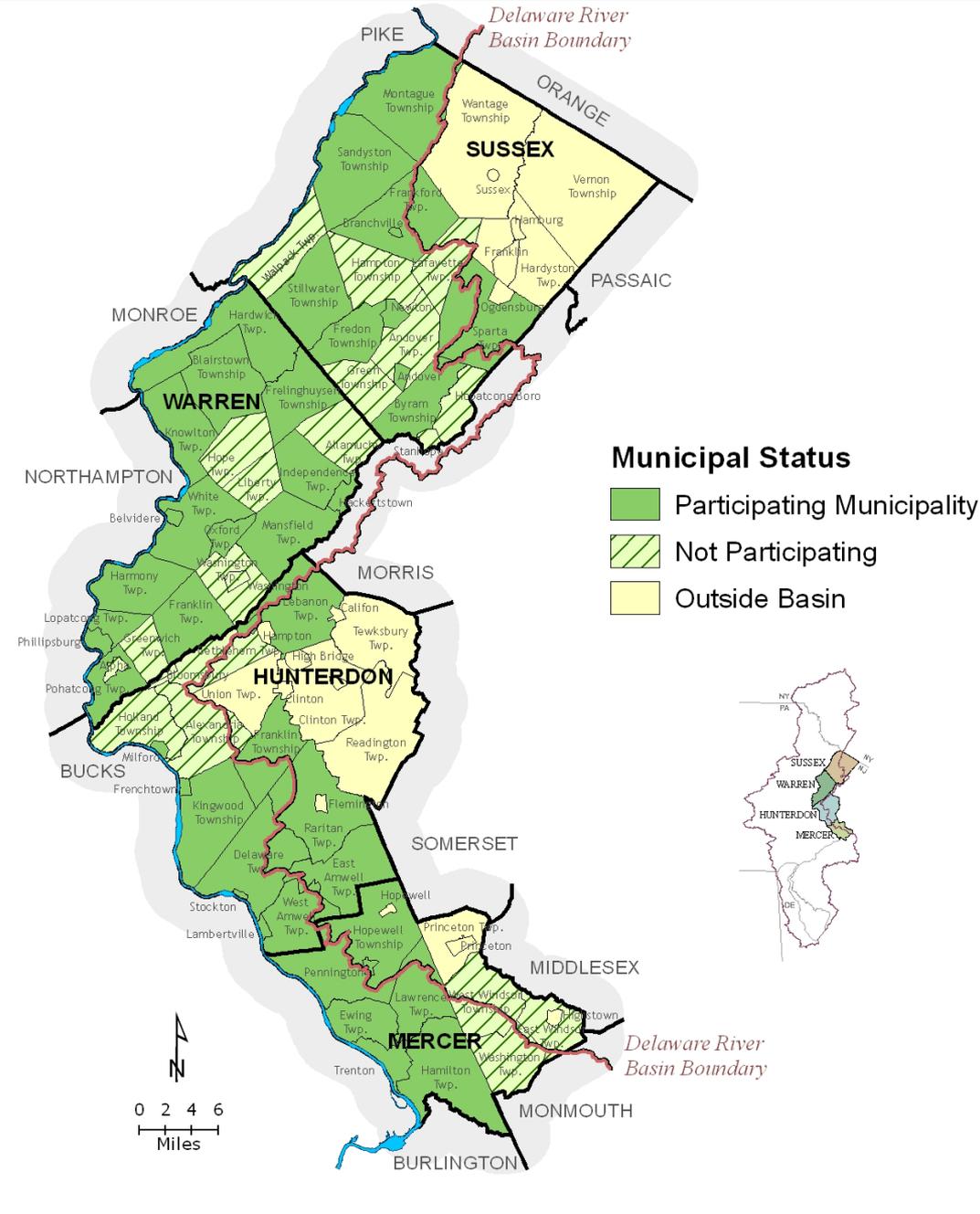
Sussex:

17 Eligible Municipalities
10 Participated

Warren:

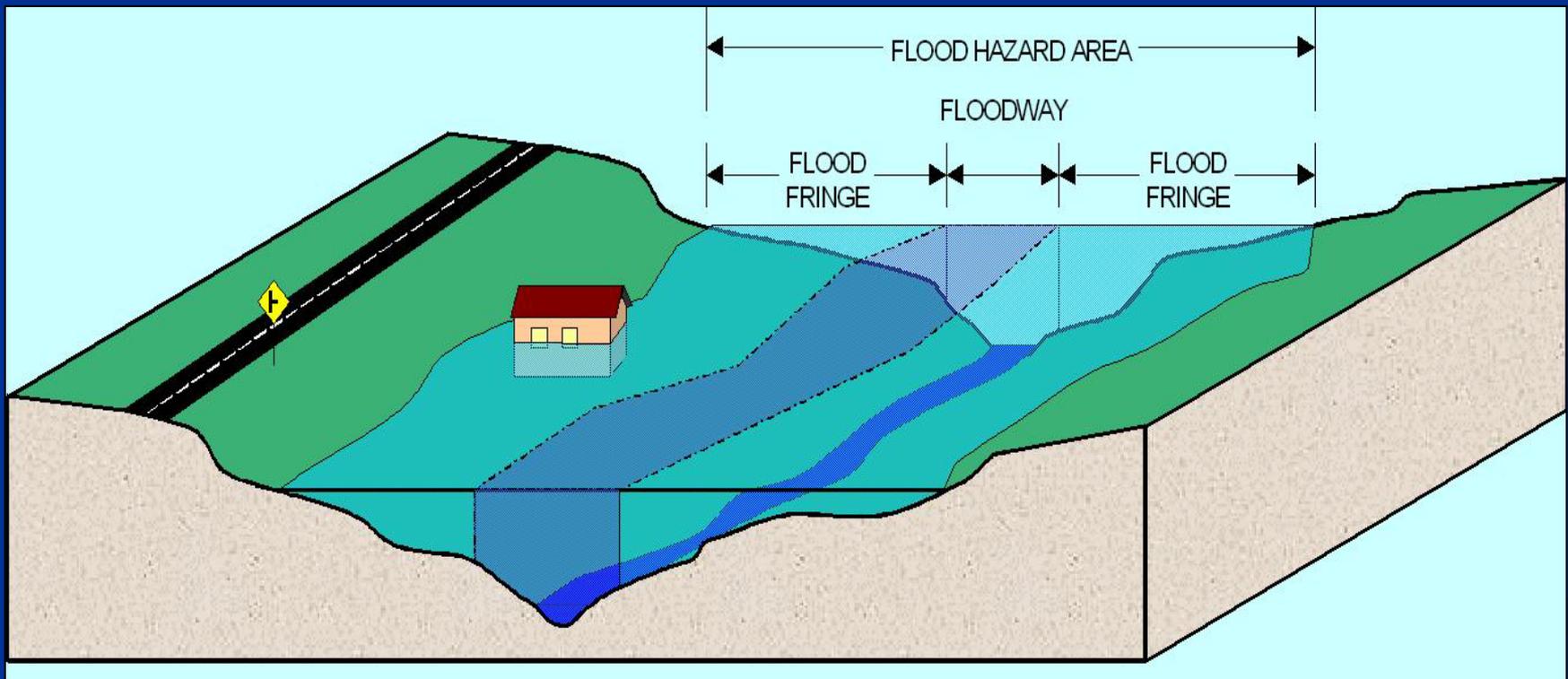
22 Municipalities
15 Participated

Total Participating:
43 municipalities



<u><i>MERCER</i></u>	<u><i>HUNTERDON</i></u>	<u><i>WARREN</i></u>	<u><i>SUSSEX</i></u>
Ewing Township	Delaware Township	Belvidere Township	Andover Borough
Hamilton Township	East Amwell Township	Blairstown Township	Branchville Borough
Hopewell Township	Franklin Township	Franklin Township	Byram Township
Lawrence Township	Frenchtown Borough	Frelinghuysen Township	Frankford Township
Pennington Borough	Hampton Borough	Town of Hackettstown	Fredon Township
Trenton City	Kingwood Township	Hardwick Township	Montague Township
<i>6 Municipalities</i>	Lambertville City	Harmony Township	Town of Newton
	Lebanon Township	Independence Township	Sandyston Township
	Milford Borough	Knowlton Township	Sparta Township
	Raritan Township	Lopatcong Township	Stillwater Township
	Stockton Borough	Mansfield Township	<i>10 Municipalities</i>
	West Amwell Township	Oxford Township	
	<i>12 Municipalities</i>	Town of Phillipsburg	
		Pohatcong Township	
		White Township	
		<i>15 Municipalities</i>	

Flood Hazard Identification and Profiling

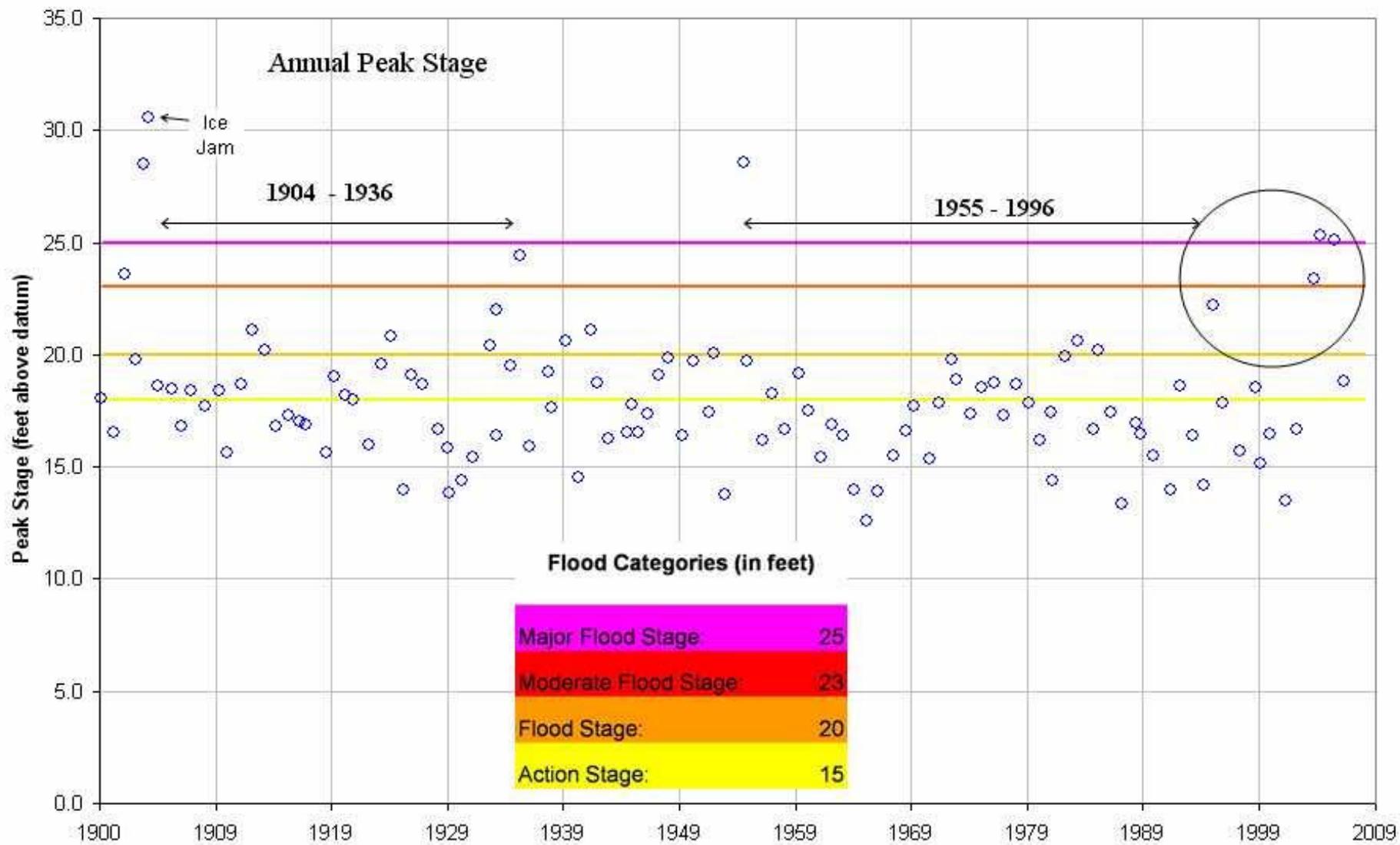


(Source: NJDEP, 2007)

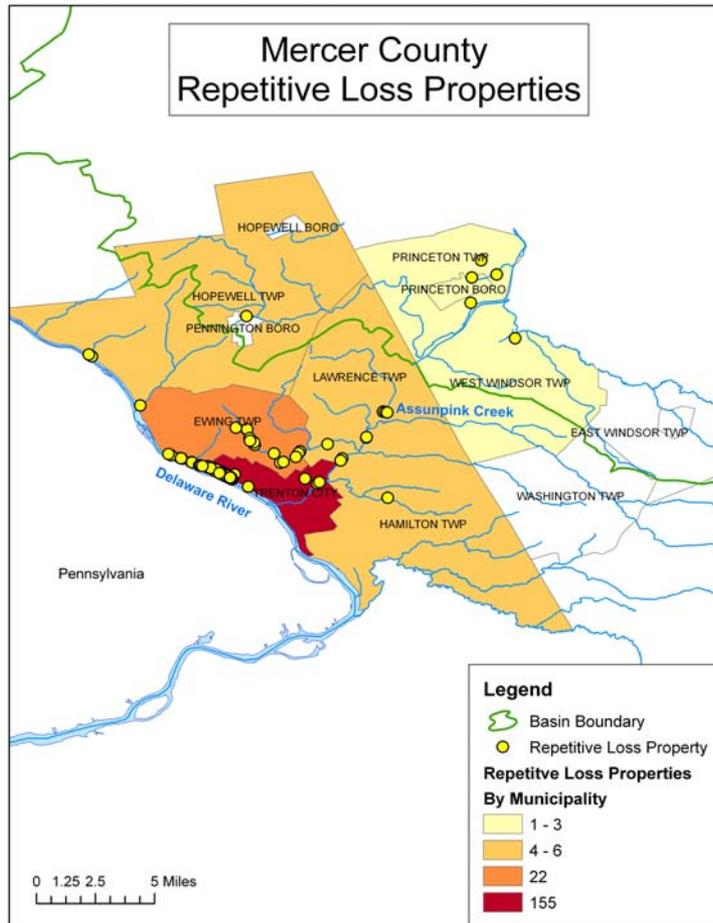
Summary of Presidential Declared Disasters in New Jersey from 1955-2007

New Jersey Disaster Declarations 1955-2007			All NJ	Atlantic	Bergen	Burlington	Camden	Cape May	Cumberland	Essex	Gloucester	Hudson	Hunterdon	Mercer	Middlesex	Monmouth	Morris	Ocean	Passaic	Salem	Somerset	Sussex	Union	Warren
y = yes, county declared n = no county information																								
Aug-55	Hurricane, floods	41-DR	n																					
Mar-62	Severe storms, high tides, flooding	124-DR	n																					
Aug-65	Water shortage	205-DR	n																					
Jun-68	Heavy rains, flooding	245-DR	n																					
Sep-71	Heavy rains, flooding	310-DR	n																					
Aug-73	Severe storms, flooding	402-DR	n																					
Jul-75	Heavy rains, high winds, hail, tornadoes	477-DR	n																					
Aug-76	Severe storms, high winds, flooding	519-DR	n																					
Feb-77	Ice conditions	528-DR	n																					
Apr-84	Coastal storms, flooding	701-DR	n																					
Oct-85	Hurricane Gloria	749-DR	n																					
Mar-92	Coastal storm	936-DR		y				y	y							y		y						
Dec-92	Coastal storm	973-DR		y				y	y	y					y	y		y		y	y		y	
Jan-96	Snow, blizzard	1088-DR		y	y	y		y	y	y					y	y	y	y	y	y	y	y	y	y
Nov-96	Flooding	1145-DR			y		y					y		y	y						y		y	
Sep-97	Severe storms, flooding	1189-DR		y							y	y												
Mar-98	Coastal storm	1206-DR		y				y				y						y						
Sep-99	Hurricane Floyd	1295-DR								y			y		y		y		y		y			
Aug-00	Flooding	1337-DR											y				y					y		y
Jul-04	Severe storm, flooding	1530-DR				y	y																	
Oct-04	Tropical Depression Ivan	1563-DR											y	y								y		y
Apr-05	Severe storms and flooding	1588-DR			y					y	y		y	y			y		y				y	y
Jul-06	Severe storms and flooding	1653-DR											y	y								y		y
Apr-07	Severe storms, inland and coastal flooding	1694-DR		y	y	y	y			y	y	y	y	y	y		y		y		y	y	y	y

USGS 01463500 Delaware River at Trenton



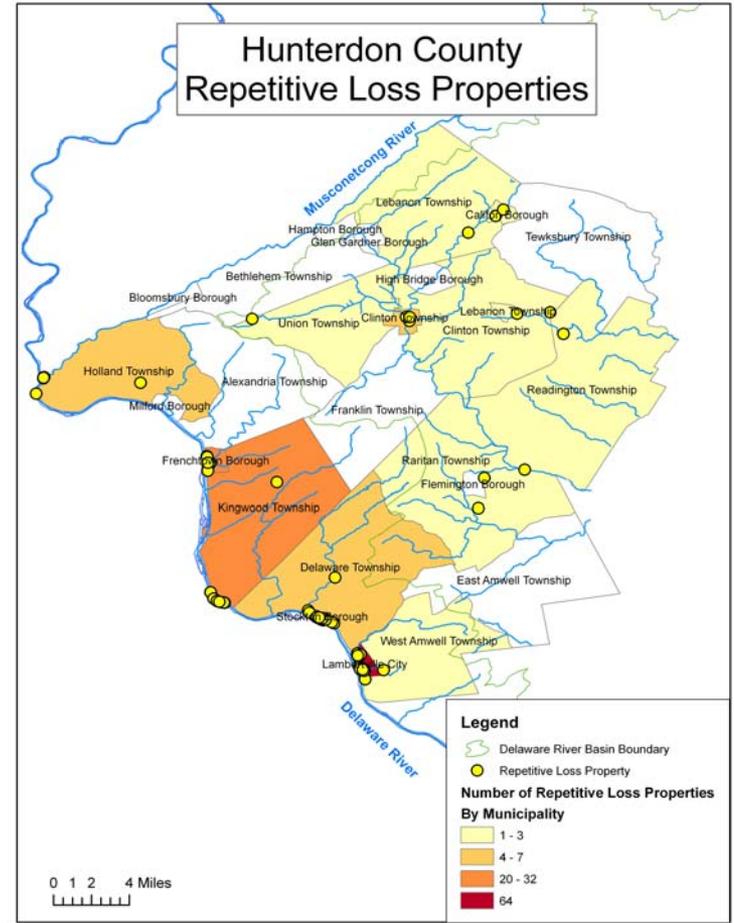
Mercer County Repetitive Loss Properties



Source: Federal Emergency Management Agency (FEMA). A property is considered a repetitive loss property when there are 2 or more losses reported which were paid more than \$1,000 for each loss. The 2 losses must be within 10 years of each other and be as least 10 days apart. Losses from 01/01/1978 - 01/31/08 that are closed are considered.

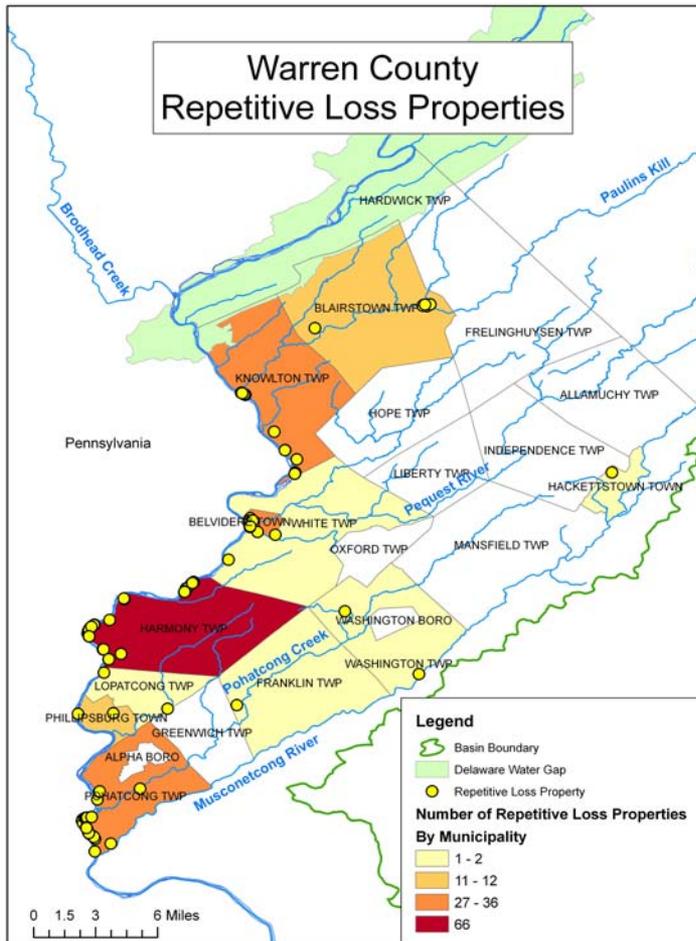
Prepared by Delaware River Basin Commission, April 2008.

Hunterdon County Repetitive Loss Properties



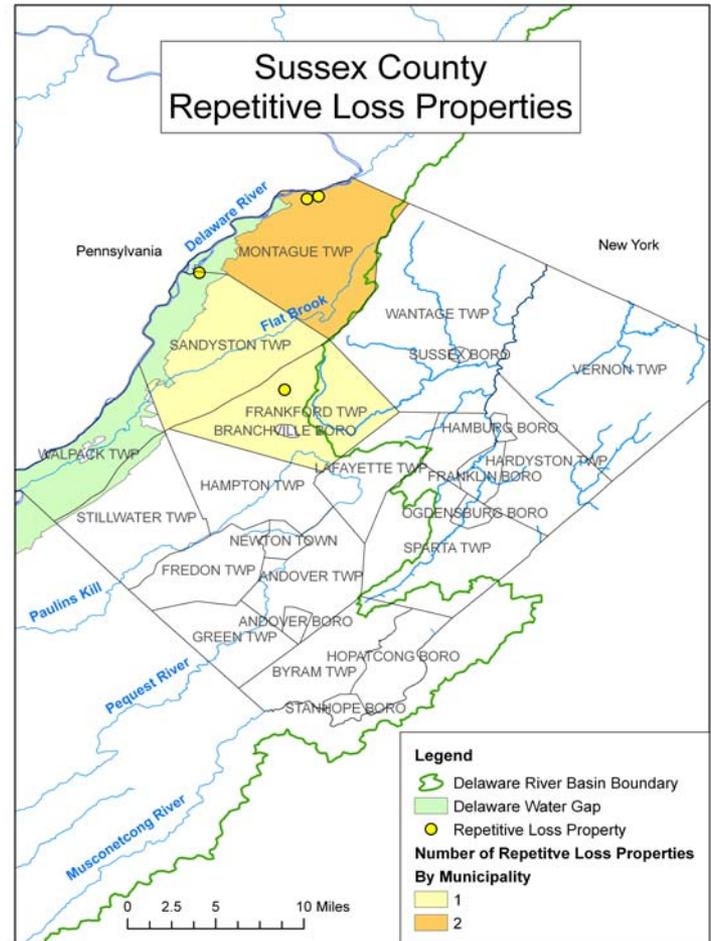
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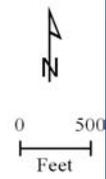
Top Ten Municipalities with Repetitive Loss Properties

Municipality	County	Number of Repetitive Loss Properties	Total Payouts for Repetitive Loss Properties	Number of Severe Repetitive Loss Properties	NFIP Policies in Force as of 01/31/08
City of Trenton	Mercer	155	\$22,611,451	3	470
Harmony Township	Warren	66	\$27,926,993	24	105
Lambertville	Hunterdon	64	\$9,278,749	1	225
Town of Belvidere	Warren	36	\$9,567,744	4	96
Stockton Borough	Hunterdon	32	\$5,257,575	2	92
Knowlton Township	Warren	32	\$4,702,982	6	61
Pohatcong Township	Warren	27	\$3,994,785	5	73
Kingwood Township	Hunterdon	24	\$3,357,547	4	47
Ewing Township	Mercer	22	\$2,354,703	1	402
Frenchtown Borough	Hunterdon	20	\$2,974,853	0	78

Source: Federal Emergency Management Agency (FEMA); 01/31/08



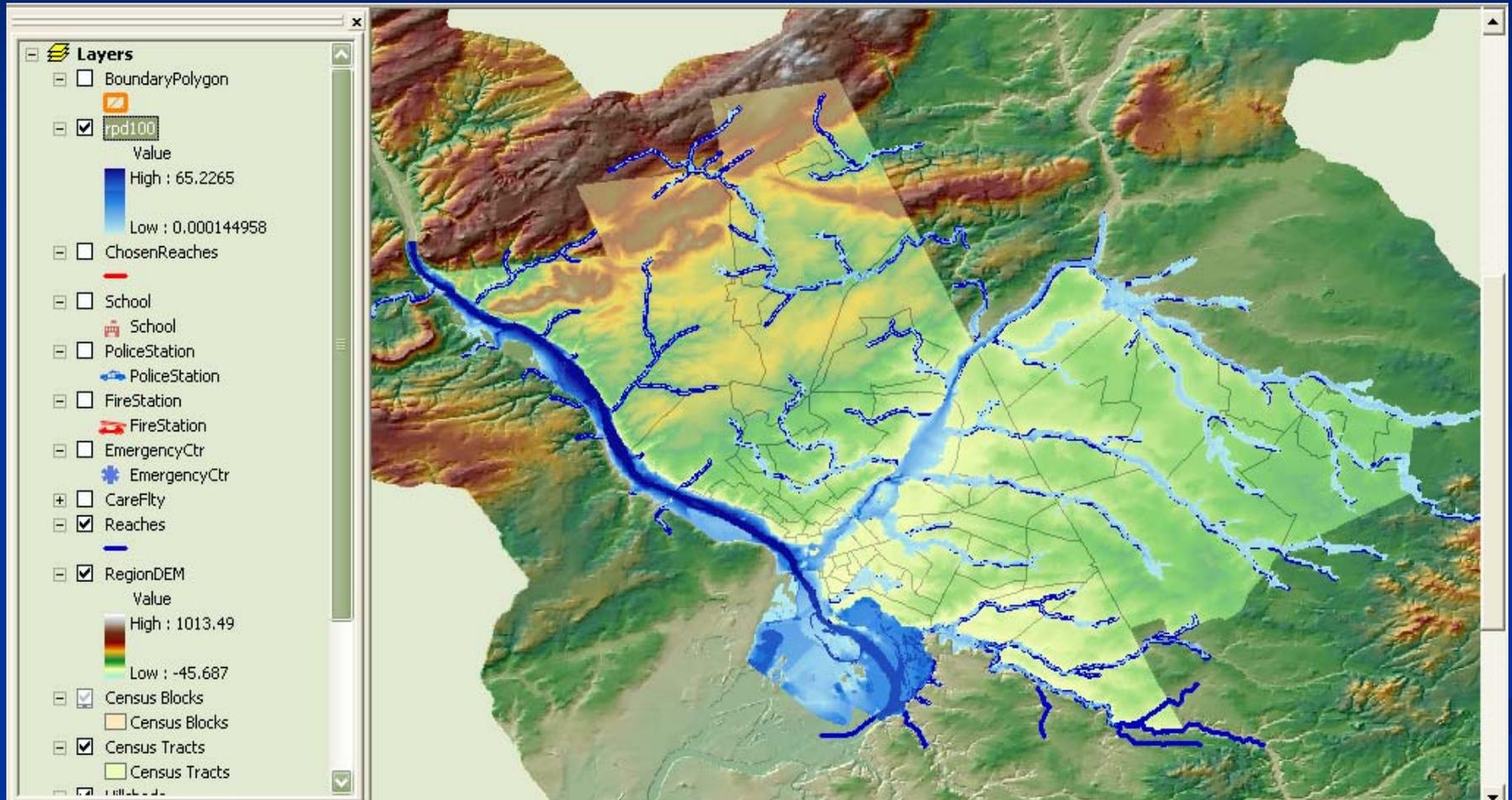
- Mercer County Critical Facility
- Waste Water Facility
- hzSchool
- Water Facility
- ▲ Police Station
- ▲ Fire Station
- H Emergency Center
- ⌂ Care Facility
- 100 Year Flood Plain
- 500 Year Flood Plain
- Municipal Boundary



Essential Facilities Found to be at Risk:

- Trenton Water Filtration Plant
- Ewing Sewage Pump Station
- Villa Victoria Academy
- Mercer County Correction Center
- Frenchtown Sewer Plant
- Stockton Sewer Pump Station
- Stockton Fire Department
- Stockton Borough Hall
- Phillipsburg WWTP, Lift Station
- Fredon Civic Center

Risk Assessment



HAZUS Flood Model Results



- Hazard maps
 - Flood depth
- Building losses
 - By occupancy and by building type
 - By full replacement value and depreciated replacement value
- Essential facilities
 - Building and content losses

Risk Assessment Results

- Over 67,670 acres total fall within the 100-year floodplain
 - (~7% of total land area)
- Over \$180 Million total in projected direct economic losses to buildings
 - \$77M – Mercer, \$39M – Hunterdon, \$23M – Warren and \$41M - Sussex
- Building stock at risk
 - 4,941 – Mercer, 1,904 – Hunterdon, 1,505 – Warren and 1,895 - Sussex
- Repetitive Flood Risk Analysis
 - i.e. Harmony Township, Warren County is \$10.3M over 100 years

General Building Stock in the Floodplain									
Building Exposure in the Floodplain (thousands of dollars)									
Return Period:	County Name	Population	Residential	Commercial	Industrial	Agriculture	Religion	Government	Education
100 year	Mercer	18400	\$1,146,277	\$347,232	\$46,460	\$2,258	\$19,552	\$4,992	\$17,240
500 year	Mercer	23950	\$1,466,680	\$443,823	\$59,076	\$2,706	\$25,104	\$13,535	\$20,195
Contents Exposure in the Floodplain (thousands of dollars)									
100 year	Mercer	18400	\$573,468	\$353,774	\$66,160	\$2,258	\$19,552	\$5,215	\$21,378
500 year	Mercer	23950	\$733,752	\$452,449	\$84,437	\$2,706	\$25,104	\$13,786	\$24,525
Total Exposure in the Floodplain (thousands of dollars)									
100 year	Mercer	18400	\$1,719,745	\$701,005	\$112,620	\$4,516	\$39,104	\$10,206	\$38,617
500 year	Mercer	23950	\$2,200,432	\$896,271	\$143,512	\$5,413	\$50,207	\$27,321	\$44,720
Building Count (# of buildings) in the floodplain									
100 year	Mercer		4786	129	12	1	7	4	2
500 year	Mercer		6004	166	16	1	8	11	2
Economic Loss (General Building Stock)									
Building Loss (thousands of dollars)									
Return Period:	County Name	Residential	Commercial	Industrial	Agriculture	Religion	Government	Education	
100 year	Mercer	\$50,028	\$19,169	\$1,450	\$222	\$1,877	\$55	\$3,023	
500 year	Mercer	\$71,626	\$51,142	\$3,098	\$255	\$4,011	\$177	\$3,734	
Content Loss (thousands of dollars)									
100 year	Mercer	\$27,409	\$22,442	\$2,718	\$248	\$2,451	\$80	\$4,304	
500 year	Mercer	\$39,304	\$59,190	\$6,634	\$286	\$5,327	\$241	\$5,356	
Total Loss (thousands of dollars)									
100 year	Mercer	\$77,437	\$41,611	\$4,168	\$470	\$4,327	\$134	\$7,326	
500 year	Mercer	\$110,931	\$110,331	\$9,731	\$540	\$9,338	\$418	\$9,090	

MERCER	
EWING TWP	Medium
HAMILTON TWP	Medium
HOPEWELL TWP	Medium
LAWRENCE TWP	Medium
PENNINGTON BOROUGH	Low
TRENTON CITY	High

HUNTERDON	
DELAWARE TWP	Medium
EAST AMWELL TWP	Low
FRANKLIN TWP	Low
FRENCHTOWN BOROUGH	High
HAMPTON BOROUGH	Low
KINGWOOD TWP	High
LAMBERTVILLE CITY	High
LEBANON TWP	Low
MILFORD BOROUGH	Low
RARITAN TWP	Medium
STOCKTON BOROUGH	High
WEST AMWELL TWP	Low

WARREN	
BELVIDERE TWP	High
BLAIRSTOWN TWP	High
FRANKLIN TWP	Low
FRELINGHUYSEN TWP	Low
HACKETTSTOWN TOWN	Low
HARDWICK TWP	Low
HARMONY TWP	High
INDEPENDENCE TWP	Low
KNOWLTON TWP	High
LOPATCONG TWP	Medium
MANSFIELD TWP	Low
OXFORD TWP	Low
PHILLIPSBURG TOWN	High
POHATCONG TWP	High
WHITE TWP	Medium

SUSSEX	
ANDOVER BOROUGH	Low
BRANCHVILLE	Low
BYRAM TWP	Low
FRANKFORD TWP	Low
FREDON TWP	Low
MONTAGUE TWP	Medium
NEWTON TOWN	Low
SANDYSTON TWP	Low
SPARTA TWP	Low
STILLWATER TWP	Low

Risk Assessment Results

Mitigation Strategy



- Delaware River Basin
- New Jersey
- County/Local

Delaware River Basin Interstate Flood Mitigation Task Force

“There is no one set of mitigation measures that will stop flooding along the Delaware, it is only through a combination of local and regional measures that resiliency to flooding in the basin will be improved.”



- July 2007, Action Agenda

New Jersey Governor's Flood Mitigation Task Force August 2006 Report – 37 Recommendations



Updated Flood Hazard Area Control Act Rules (N.J.A.C. 7:13) - Adopted November 5, 2007



- Requires elevations to be set at least one foot above the State's flood hazard area design flood elevation;
- a 0% net-fill requirement now applies to all non-tidal flood hazard areas;
- expands riparian zones to 50, 150 or 300 feet in width.

County/Local Mitigation Action Plans

1. **Prevention** (Open space preservation, Floodplain regs)
2. **Property Protection** (Acquisition, Elevation, Relocation, Structural Retrofits)
3. **Public Information and Awareness** (Outreach, Education, Training)
4. **Emergency Services** (Warning systems; Community Notification Systems)
5. **Natural Resource Protection** (Floodplain protection, Riparian buffers)
6. **Structural Projects** (Levees, floodwalls, floodgates, Stormwater Retrofits)

County/Local Mitigation Action Plans

Over 160 Mitigation Actions Total

- **Acquisitions:** Hamilton (M), Trenton (M), Kingwood (H), Stockton (H), Harmony (W), Knowlton (W)
- **Elevations:**
Hopewell (M), Trenton (M), Kingwood (H), Lambertville (H), Raritan (H), Belvidere (W), Frelinghuysen (W), Independence (W), Oxford (W), Pohatcong (W)
- **Elevate Utilities:**
Trenton (M), Hamilton (M), Frenchtown (H), Blairstown (W), Knowlton (W)

County/Local Mitigation Action Plans

■ **Stream Desnagging/Restoration:**

Lawrence (M), Franklin (H), Hampton (H), Belvidere (W),
Blairstown (W), Franklin (W), Hackettstown (W),
Independence (W), Mansfield (W), White (W), Montague
(S), Newton (S), Sparta (S), Stillwater (S)

■ **Backflow Prevention Devices:** Ewing (M), Frenchtown (H), Lambertville (H), Stockton (H), Belvidere (W), Blairstown (W), Phillipsburg (W), Pohatcong (W)

■ **Flood Warning:**

Hamilton (M), East Amwell (H), Allamuchy (W),
Hardwick (W), White (W), Montague (S)

County/Local Mitigation Action Plans

- **Dam Studies:** Allamuchy (W), Fredon (S), Newton (S), Sparta (S)
- **Structural:**
 - Flood proof Trenton Water Filtration Plant – Trenton (M)
 - Raise Canal Bank – Hopewell (M)
 - Relocate Fire Department – Stockton (H)
 - Flood proof Borough Hall – Stockton (H)
 - Swan Creek Flood Gate and Lift Station – Lambertville (H)
 - Decommission Pequest Dam – Belvidere (W)
 - Levee along Paulinskill – Blairstown (W)
 - Modifications to Lift Station and WWTP – Phillipsburg (W)
 - Study removal of Musconetcong Dam – Pohatcong (W)
 - Dam Improvements – Byram (S)

Next Steps

- Once the plan is approved by FEMA, All 43 municipalities will adopt the Plan
- Investigate Grant Availability
- Leverage Funding Opportunities