Resilience and Flooding

Sea Level Rise and Flooding: Planning and Law for Local Governments

Satellite Beach, 2016

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Resilience

- Resilience is the capacity of individuals, neighborhoods, institutions, businesses, and systems to thrive in an inclusive manner amidst challenging conditions and to prepare and plan for, absorb, recover from, and more successfully adapt to adverse events.

Resilience

- Resilience and Equity
- Resilience achieved through Plan Integration
- Resilience achieved through Pre-planning
- Resilience achieved through Mitigation

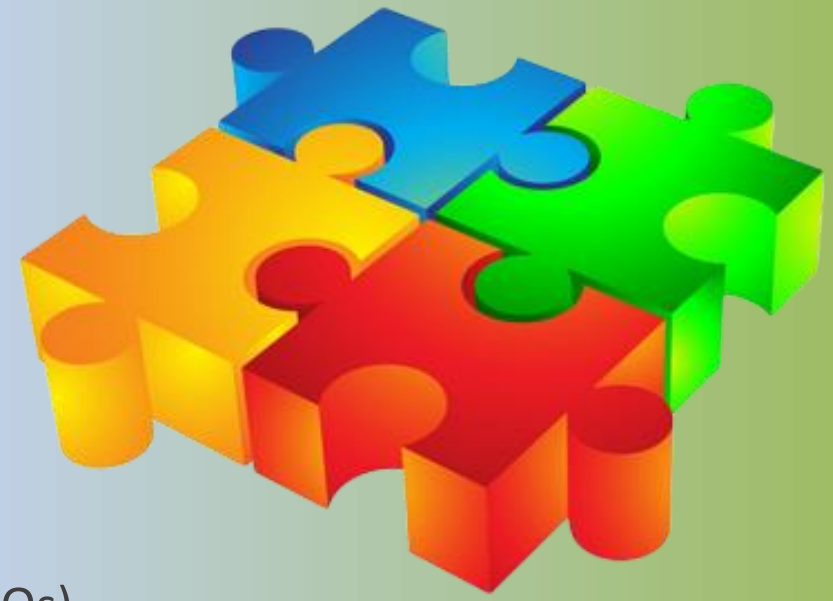
Resilience and Equity

"To be able to declare that community resilience has been achieved, we must develop systems that address the needs and provide protection for those most vulnerable and marginalized."

Overarching intended resilience outcomes that demonstrate successful adaptation to the shifts in sea level rise, and extreme weather caused by climate change include equitable preservation of:

- Life and health
- Safety and wellbeing
- Community and culture
- Land, home, and property
- Livelihoods and economic security
- Core systems, services, and basic needs
- Environmental quality
- Democratic systems of governance

Plan Integration



- Comprehensive Plans
- Floodplain Management Plans
- Climate Action Plans
- Redevelopment Plans
- Historic Preservation Plans
- Long-Range Transportation Plans (MPOs)
- Public Works Programs (sewer & water)
- Sanitary Landfill Programs
- Recreational Facility Plans
- Land Development Regulations

Benefits of Plan Integration

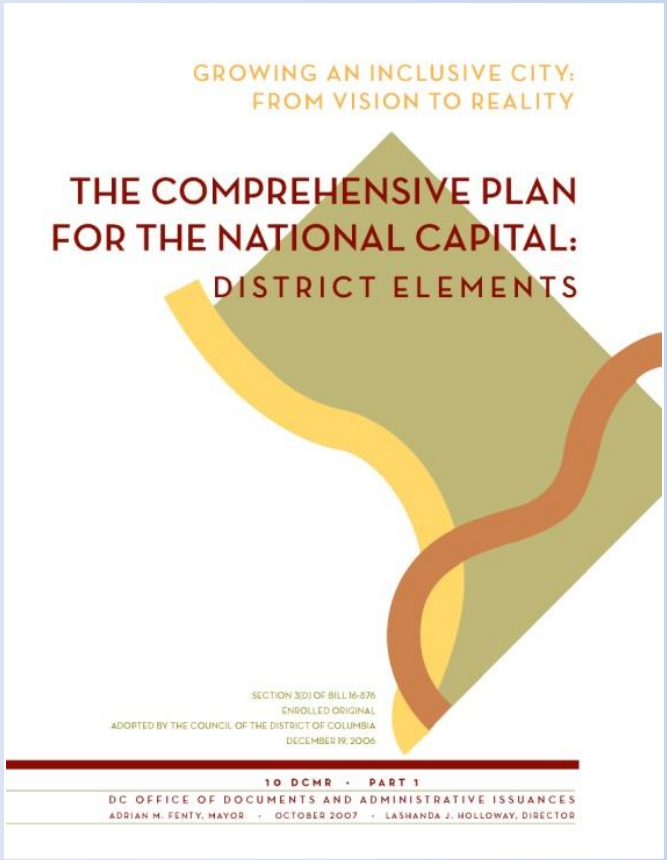
- Reduction in long-term loss prevention
- Formation of beneficial partnerships
- Expansion of external funding opportunities
- Facilitation of quicker recovery (speed vs. deliberation)
- Resolution of issues locally rather than by external parties

More Benefits

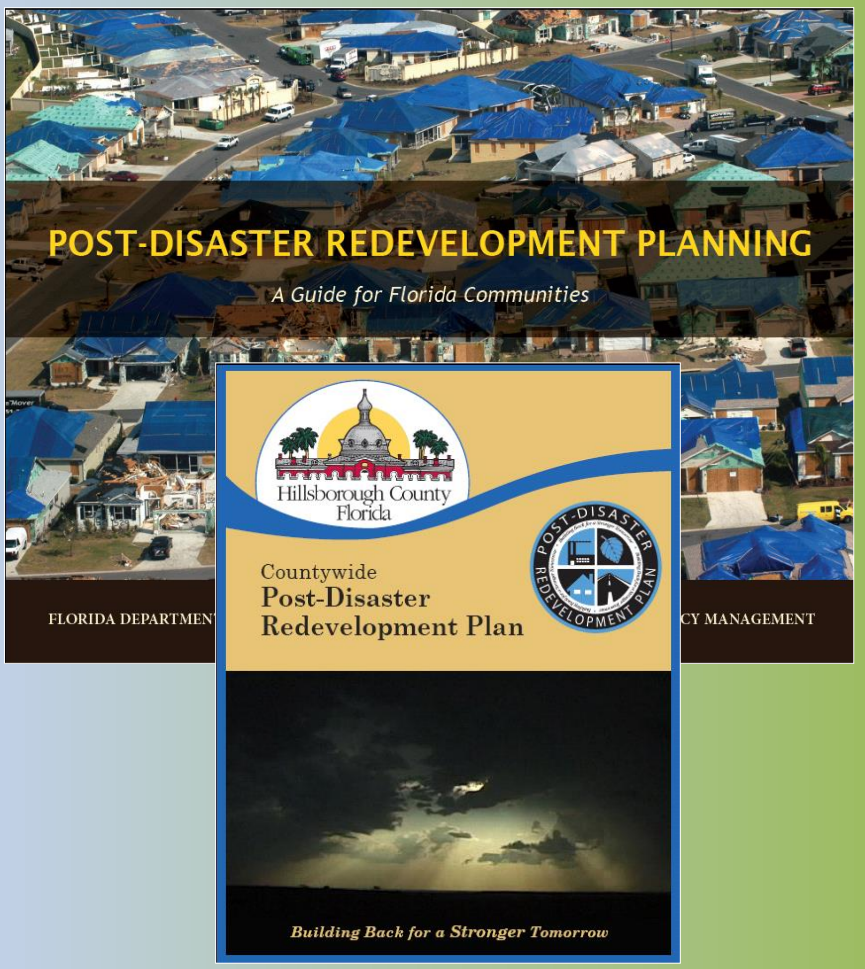
- Avoids duplication of efforts
- Avoids conflicts in policy matters and procedures
- More effective utilization of scarce resources
- In Florida, Comprehensive Plans have the force of law
- Integration into Comp Plan "puts teeth" into mitigation

Resilience Achieved Through Pre-planning

DC Comprehensive Plan Update

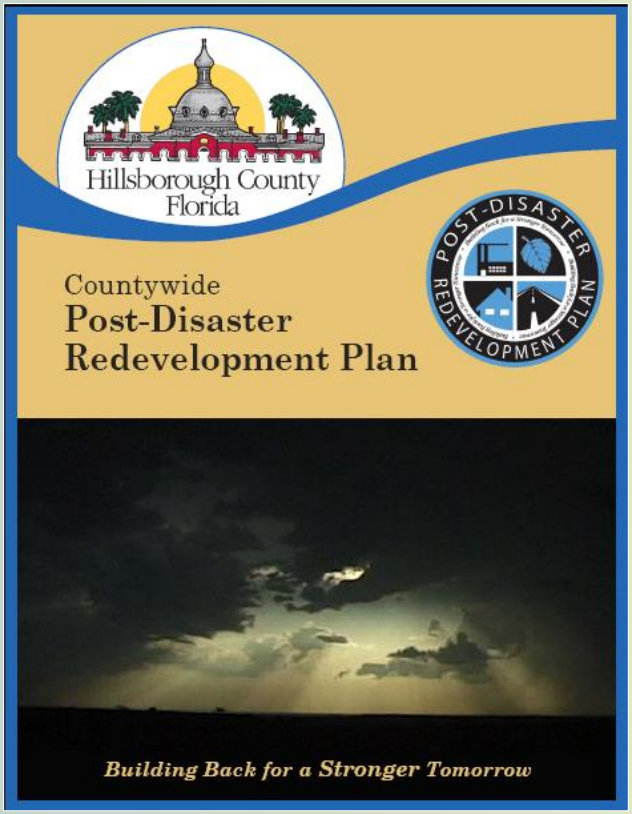


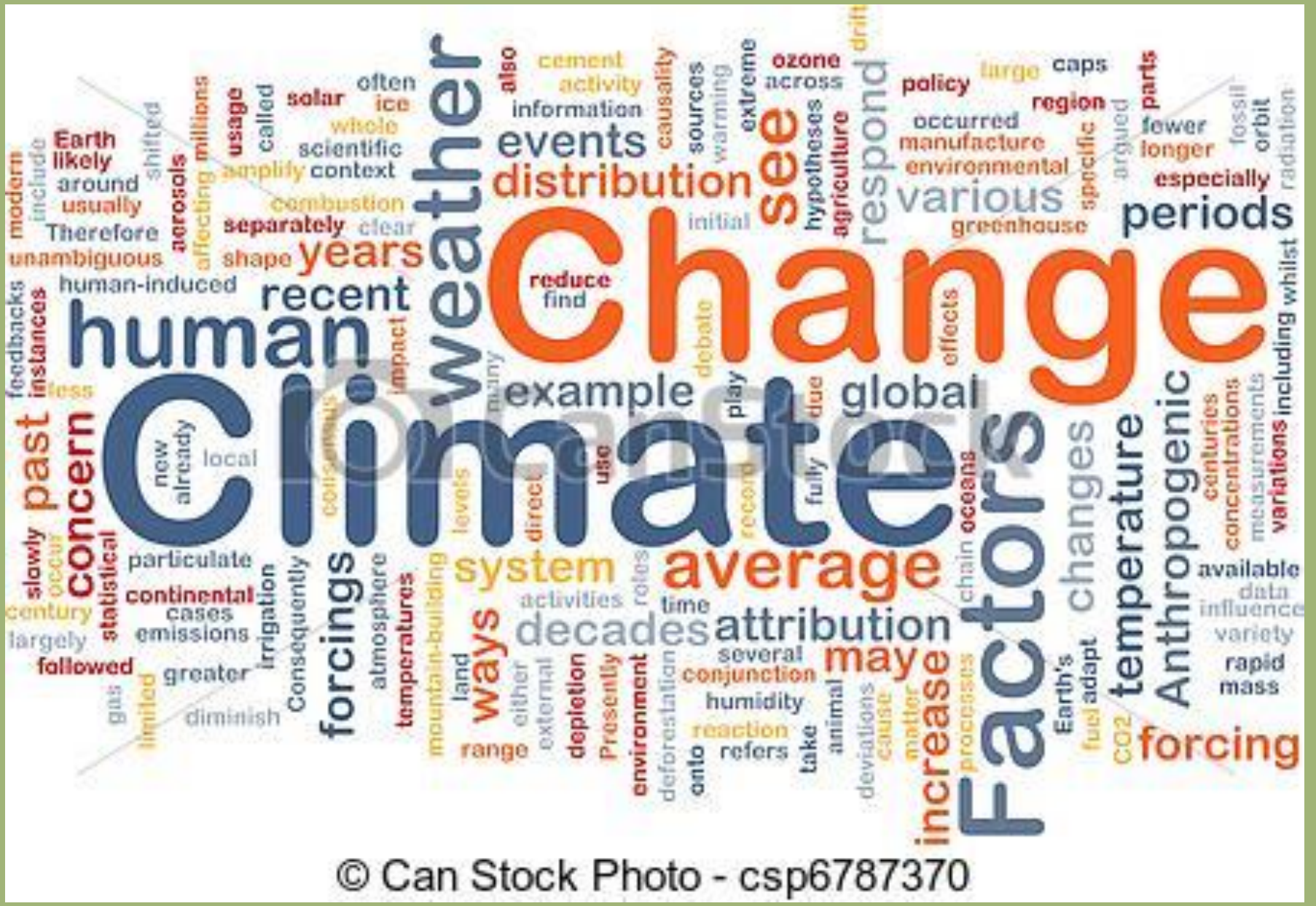
Post-Disaster Redevelopment Planning



Hillsborough County's PRA Goals

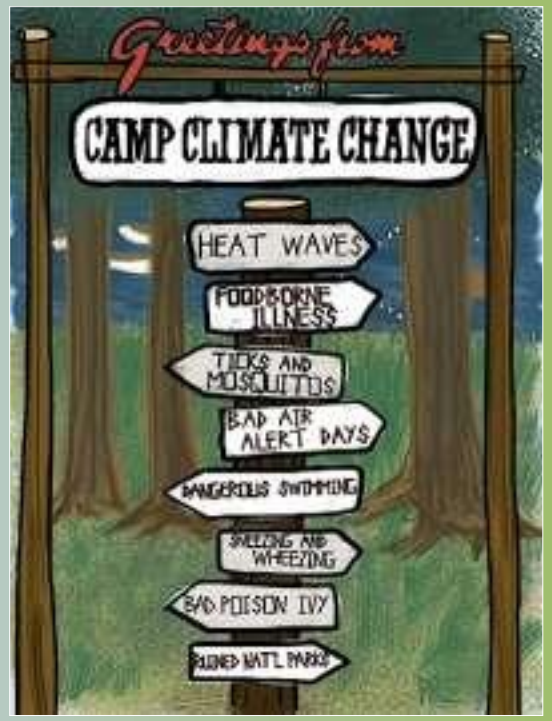
- Rapidly restore centers of economic activity and critical facilities
- Provide a staging area for restoring nearby impacted communities
- Locate recovery services in efficient and convenient hubs
- Facilitate growth into disaster resilient centers





Factors Affecting Climate Change

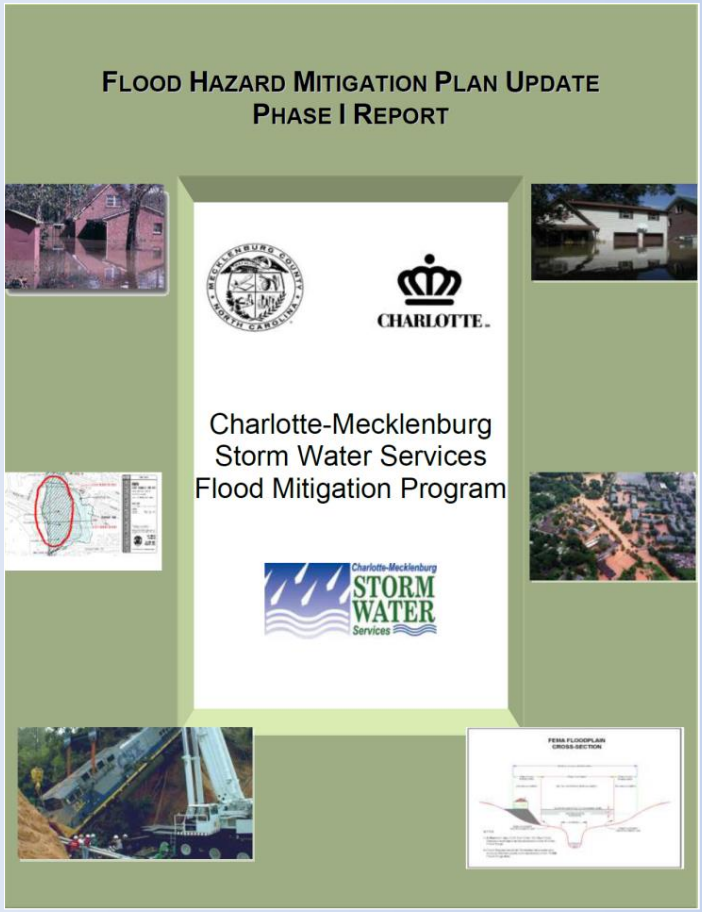
- Rising seas
- Precipitation variability
- Higher temperatures
- More severe storms



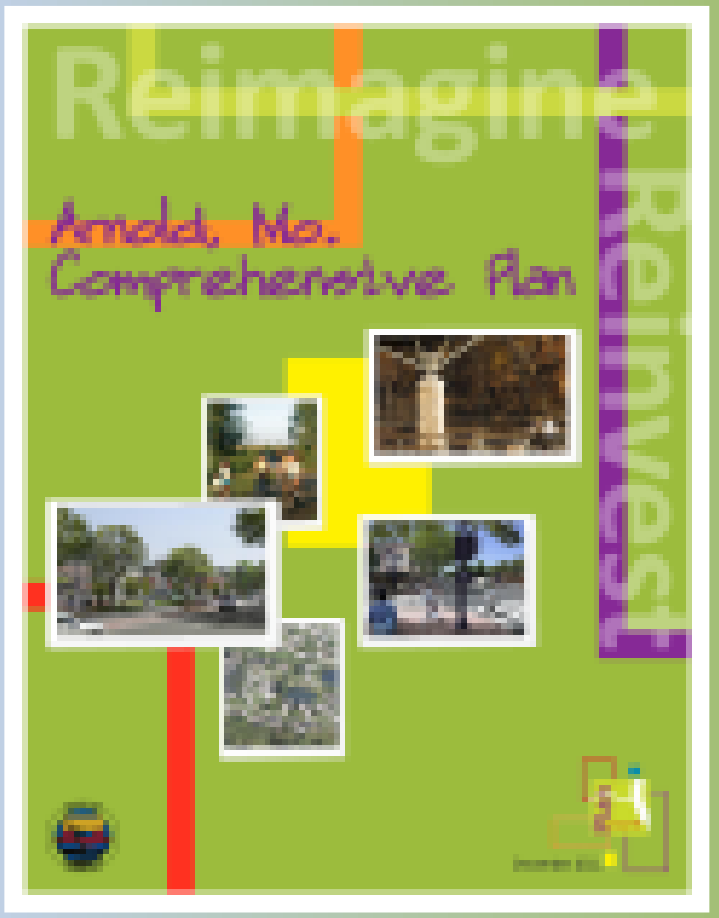
Impact of climate changes that have led to reassessment of how these changes have impacted hazards like wildfire, drought, heat, and flooding.

Resilience Achieved Through Mitigation

Charlotte/Mecklenberg, NC



Arnold, MO



City of Arnold, MO

1993 Floods

- Confluence of Meramec and Mississippi Rivers
- Backwater Flooding

Buy-out Program

- 72 properties in floodplain
- FEMA $2.9 million
- CDBG $1.4 million

Floodplain Management Plan *"recommends incorporating all lands within the 100-year floodplain into a greenway."*

Mary Holden
Community Development Director
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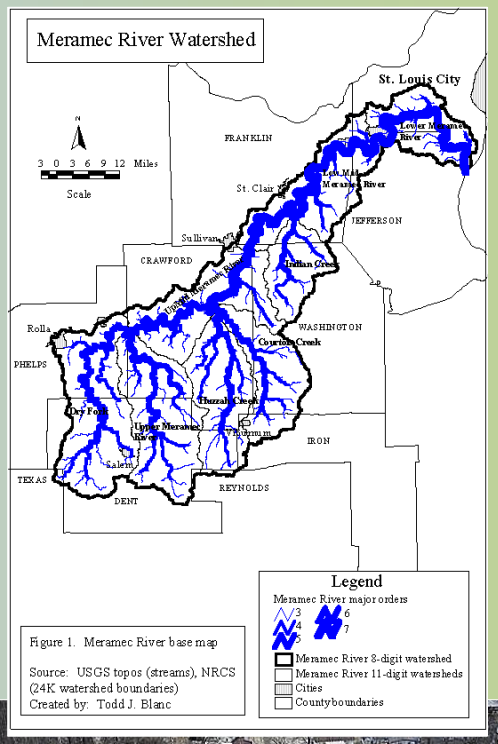
CITY OF ARNOLD, MO – 2015

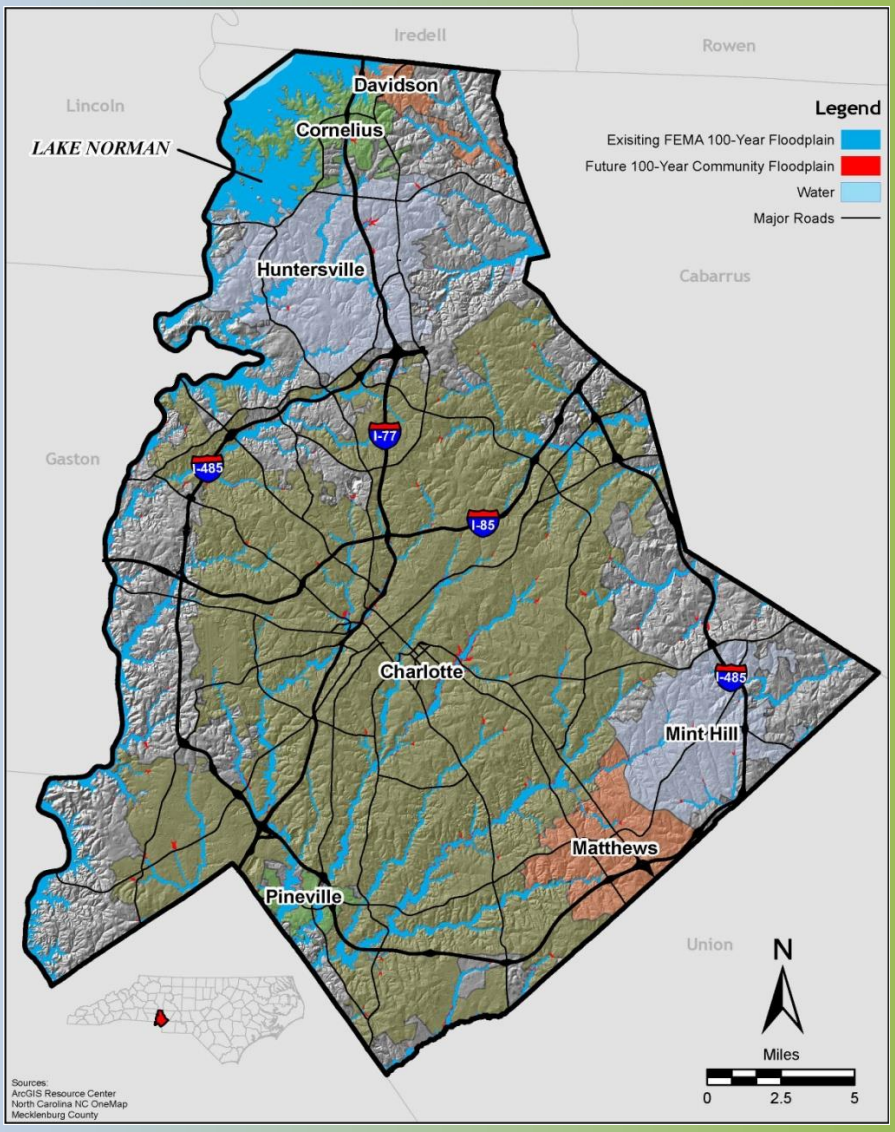
- Arnold – population 22,000
- The December 2015 flood
- 10 inches of rainfall in 72 hours
- Meramec River averages 5 feet deep
- Crested at 47 feet – 2 feet higher than 1993 threshold of 45.3 feet
- Most flooding occurred outside 100 year floodplain
- Metropolitan Sewer District (St. Louis) – power outage/ wastewater treatment tanks overflowed



(AP Photo/Jeff Roberson)

Mecklenburg County, NC

- Pop. 919,628 (2010)
  - 32% increase since 2000
- 330 regulated stream miles



Tim Trautman, P.E. , CFM
Floodplain Program Manager
(980) 314-3224

Flood History in Charlotte, NC

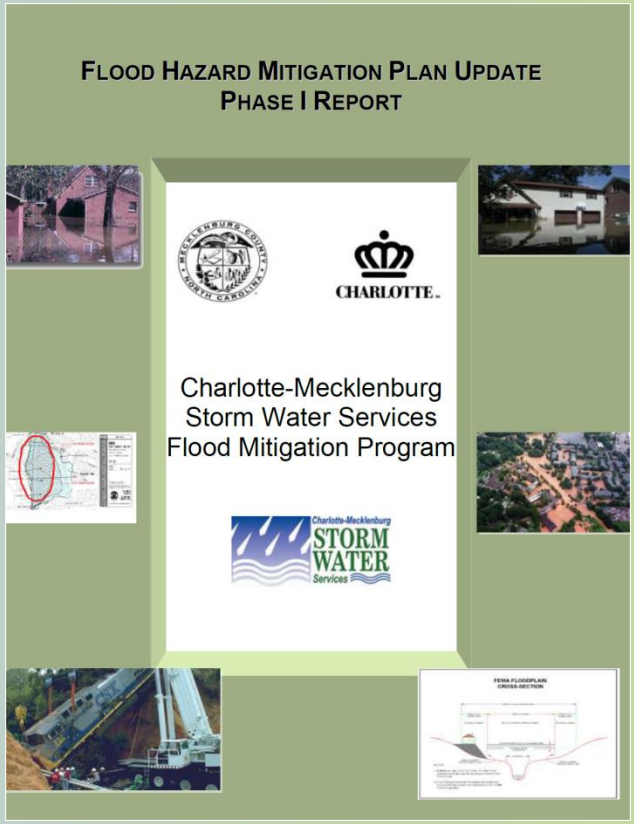
- Nearly 50 major flood events in the past century
  - 17 known deaths and more than $80 million in property damage
- Heavy impact from tropical systems
  - Tropical Storm Jerry, 1995
  - Tropical Storm Danny, 1997
  - Tropical Storm Fay, 2008

The Buyout Program

- 3,000+ properties in FEMA Floodplain
- 4,400+ properties in Community (future) Floodplain
- 450 properties purchased since 2003
- Funded by
  - HMGP
  - Stormwater Utility
  - Quick Buy Program
- Two-pronged process
  - New development
  - Old development

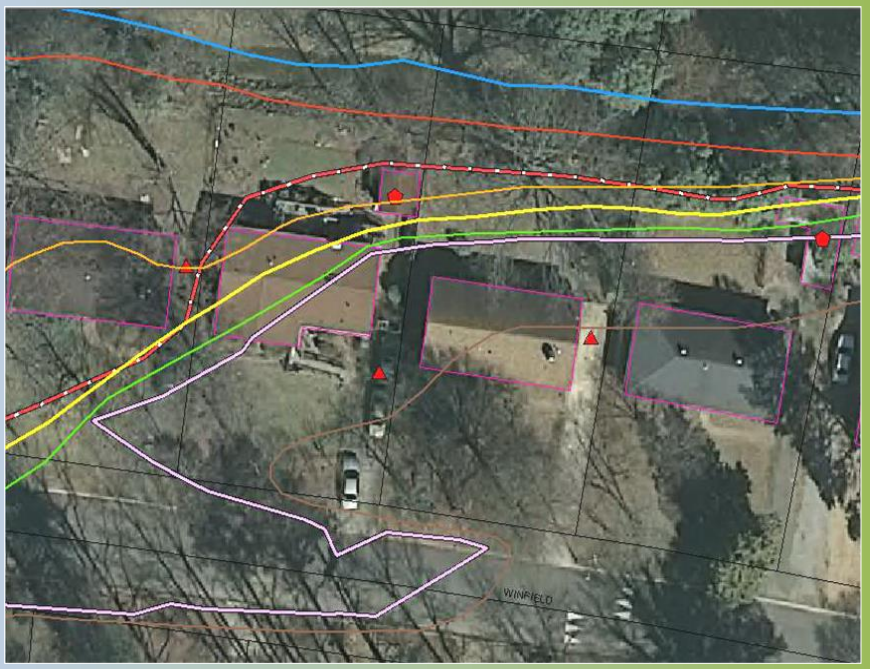
Flood Risk Assessment & Risk Reduction

- Prepared as an update to existing flood mitigation plans
- Purpose
  - To recommend specific flood mitigation techniques at a building or parcel level
  - To assist in planning, prioritizing, and funding future flood mitigation projects
  - Use a new, comprehensive and holistic approach to flood risk assessment and reduction
  - Create a broader and more inclusive risk-based strategy



Impact-based Scoring

- Each property independently assessed in GIS using aerial imagery, flood model data, building footprints, elevation certificates, and other county data layers
- Manual processing used for pilot studies but will become automated as part of new planning tool



Impact-based Scoring

Criteria	Property Flood Impacts
A	Flooding above the lowest **finished floor** of a building
F	Structure is **completely surrounded** by flood water AND is a **Critical Facility**
H	Flood water is **touching a portion of the building** AND has **structural damage** (subsidence, shifting, cracking) as a result of cumulative flooding
G	Structure is **completely surrounded** by flood water AND is **multi-family residential** (additional people, vehicles)
G#	Number of units in building
B	Flooding of **electrical and/or mechanical equipment**
D	Property is **completely surrounded** by flood water (ingress/egress to flooded property)
C	Flood water is **touching a portion of the building** (likely crawlspace or unfinished basement being impacted)
E	Structure is **completely surrounded** by flood water (ingress/egress to building)
J	Flooding around area where single-family residential **vehicles** are typically parked (*see separate guidelines*)
I1*	Flooding of **SIGNIFIGANT exterior property improvements** which are deemed functional necessities to reasonable use of single family residential property (*see separate guidelines*)
I2*	Flooding of **MODERATE exterior property improvements** which are deemed functional necessities to reasonable use of single family residential property (*see separate guidelines*)
K	Flooding of any **yard** (any portion of parcel)

IMPACT-BASED SCORING

		Storm Event Recurrence Interval <---- More frequent (closest to the creek) <------- -------> Less frequent (further from the creek) ---->						
Criteria	**Rating Base Points**	**2-year** *(50% annual chance)*	**5-year** *(20% annual chance)*	**10-year** *(10% annual chance)*	**25-year** *(4% annual chance)*	**50-year** *(2% annual chance)*	**100-year** *(1% annual chance)*	**500-year** *(.2% annual chance)*
A	2800	1400	560	280	112	56	28	6
B	1200	600	240	120	48	24	12	2
C	1000	500	200	100	40	20	10	2
D	1100	550	220	110	44	22	11	2
E	500	250	100	50	20	10	5	1
F	2700	1350	540	270	108	54	27	5
G	1400	700 x [# units-1]	280 x [# units-1]	140 x [# units-1]	56 x [# units-1]	28 x [# units-1]	14 x [# units-1]	3 x [# units-1]
G#	N/A	[# units]	[# units]	[# units]	[# units]	[# units]	[# units]	[# units]
H	2000	1000	400	200	80	40	20	4
I1	600	N/A	N/A	60	N/A	12	6	N/A
I2	300	N/A	N/A	30	N/A	6	3	N/A
J	600	N/A	N/A	60	N/A	12	6	N/A
K	30	15	6	3	1	1	0	0

THANK YOU

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