

# Assessing Vulnerabilities and Identifying Adaptation Strategies – Planning for Future Flood Risk in Your Community



# Why Plan for Future Flood Risk?

- Delaware communities are already vulnerability to floods.
- The climate is changing, these changes are becoming more pronounced and they will exacerbate many existing conditions and hazards.
- Today's choices will shape tomorrow's vulnerabilities.
- Government's role is provide a safe and sustainable home for its citizens.
- Significant time is required to motivate and develop adaptive capacity, and to implement changes.
- Proactive planning is often more effective and less costly than reactive planning, and can provide immediate benefits.



# Terminology

## **Hazard Mitigation**

- Any action taken to reduce or eliminate long-term risk to people and property from natural hazards and their effects.
- Works to break the cycle of disasters; improve welfare of people and communities.

## **Emergency Preparedness**

- Actions associated with the short-term response to and recovery from a disaster event.

## **Community Resilience**

- The ability of a community to “bounce back” after hazardous events such as a coastal storm or flood – rather than simply reacting to impacts.
- Linked to strengths and capacities of individuals, families, businesses, schools, hospitals, and all other parts of the community.

## **Hazard/Climate Adaptation Strategies**

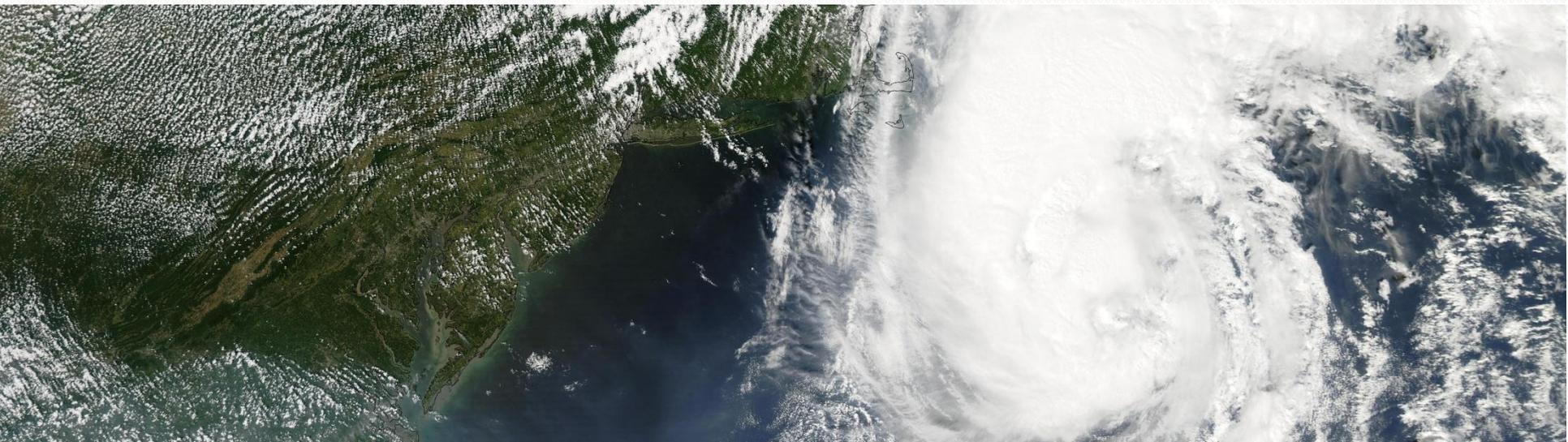
- Any measures / actions that reduce the negative impacts of hazards or provide new opportunities to prepare for future impacts.

# Natural Hazards and Hazard Mitigation Plans

**Natural Hazard** – A natural event or phenomenon that has the potential to produce harm to a person, a place or an object.

**Natural Disaster** – A natural hazard event, such as a flood or tornado, which results in widespread destruction of property or caused injury and/or death.

**Hazard Mitigation Plans** - Many communities have hazard mitigation plans --- a plan focusing on how the community should prepare for and react to natural disasters. However, the way we plan for natural hazards is based on historical information. But we know that using historical information to plan for future flood risk doesn't quite work. Public safety planning should reflect changing conditions.



# Have you been involved in hazard mitigation planning activities in your community?

## New Castle County All Hazard Mitigation Plan



### Plan Executive Summary

January 6, 2010

New Castle County Department of Public Safety  
Office of Emergency Management

City of Lewes, Delaware

search our site  [GO](#) [home](#) | [info center](#) | [contact us](#) | [site map](#)

Welcome to Lewes  
City Government  
Calendar of Events  
Online Payments  
City News & Notices  
Bulletin Board  
Marina/City Dock Info  
Parks & Beaches  
Police Department  
Lewes Fire Department  
Lewes Public Library  
BPW / Utilities  
Agendas & Minutes  
Plans & Projects  
Community Profile  
City Code Book  
Forms & Applications  
Bidding Opportunities  
Emergency Preparedness  
FAQ's  
Useful Links  
Employment Opportunities



### THE CITY OF LEWES DELAWARE



#### LEWES MITIGATION PLANNING TEAM

**PREVENTION**



**PARTNERSHIP**



**PROTECTION**



#### MITIGATION - What is it you may ask...

The Federal Emergency Management Agency's (FEMA) Mitigation Division defines mitigation as "the cornerstone of emergency management. It's the ongoing effort to lessen the impact disasters have on people's lives and property through damage prevention and food insurance. Through measures such as, building safety within the floodplain or removing homes altogether, engineering buildings and infrastructures to withstand earthquakes; and creating and enforcing effective building codes to protect property from floods, hurricanes and other natural hazards.

#### THE VALUE OF MITIGATION:

Mitigation creates safer communities by reducing losses of life and property, and enables individuals and communities to recover more rapidly from disasters. Mitigation also lessens the financial impact of disasters on individuals and the U.S. Treasury, as well as state and local communities.

#### MITIGATION TEAM:

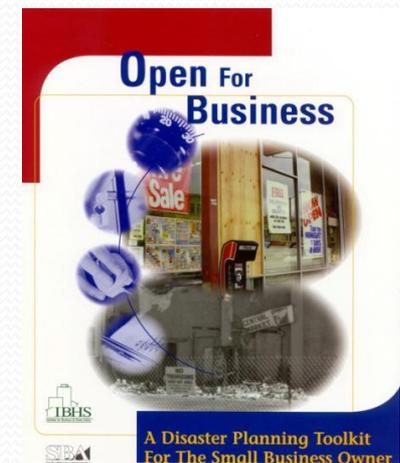
The Lewes Mitigation Planning Team was appointed by former Mayor George H.P. Smith and City Council on March 18, 2002 in order to establish an ongoing mitigation program for the City. The purpose of the Team is to carry on the pre-disaster mitigation initiatives that began in 1998 with the City's designation by the Federal Emergency Management Agency (FEMA) as a "Project Impact" Community.

Learn more about "Project Impact" and view the projects that were completed with the grant funding made available to the City under the "Project Impact" initiative.

The members of the Mitigation Planning Team work in partnership with Local, State and Federal representatives and agencies to make our community more resistant to disasters by implementing actions to reduce our vulnerability through a variety of projects and initiatives. Current members of the Team include:

# Collaborative Mitigation and Adaptation Planning

- Increases understanding of risks, vulnerabilities, and capabilities.
- Educates residents, property owners, and businesses.
- Builds partnerships within a community.
- Provides opportunities for coordination between emergency managers, floodplain managers, community planners, and others.



# This Planning Process is Not New or Different

- ✓ Build on existing plans and programs
- ✓ Engage/involve the public
- ✓ Identify problems
- ✓ Propose solutions
- ✓ Develop implementation plans
- ✓ Adopt the plan
- ✓ Monitor, evaluate, and update



# Planning / Adaptation Strategies - Examples

Many communities include consideration of flood hazard mitigation / adaptation as part of the regular update of planning documents.

- Local hazard plans
- Open space management plans
- Comprehensive plans – particularly land use and safety elements
- Zoning codes
- Land acquisition programs
- Floodplain management policies

## Climate Changes



Exeter is planning on it  
[www.CAPENH.net](http://www.CAPENH.net)



### KEENE, NEW HAMPSHIRE

Adapting to Climate Change:  
Planning a Climate Resilient Community

November 2007



### Preparing for Climate Change in Groton, Connecticut: A Model Process for Communities in the Northeast



A Report to the Town of Groton and Communities throughout New England from  
ICLEI-Local Governments for Sustainability and  
Connecticut Department of Environmental Protection  
April 2011  
Missy Stults and Jennifer Pagach

This project was funded by the U.S. Environmental Protection Agency's Climate Ready Estuaries program and the Long Island Sound Study.

### The City of Lewes Hazard Mitigation and Climate Adaptation Action Plan



# Steps in the Process

1. Community commitment to the project and process; who should be involved? (e.g. public engagement; establishment of Community Task Force).
2. Identify existing hazards / climate impacts and associated vulnerabilities.
3. Identify key vulnerabilities for which to plan.
4. Select hazard mitigation/climate adaptation strategies and actions.
5. Create implementation plans.
6. Develop action plan based on community needs.
7. Review and revise priorities and strategies as needed.

# Guide Local Officials and Residents Through the Process of:

- ***synthesizing available information*** on risks and hazards in the community;
- ***assessing vulnerabilities*** and identifying data/planning gaps, especially related to natural hazards, climate change and associated risks;
- ***developing recommendations*** and strategies from local, regional, and national best practices;
- ***identifying strategic opportunities*** to increase community resiliency;
- ***ensuring outcomes are reflective of local needs and capabilities.***



# Vulnerability Self-Assessment

Identify existing hazards and future vulnerabilities.

- Where are they?
- Who or what do they affect?



How could \_\_\_\_\_ (people, infrastructure, or natural resources) be impacted by increased flooding?

What actions can be taken to address these impacts?

# Visualizing Vulnerabilities

## Group Activity

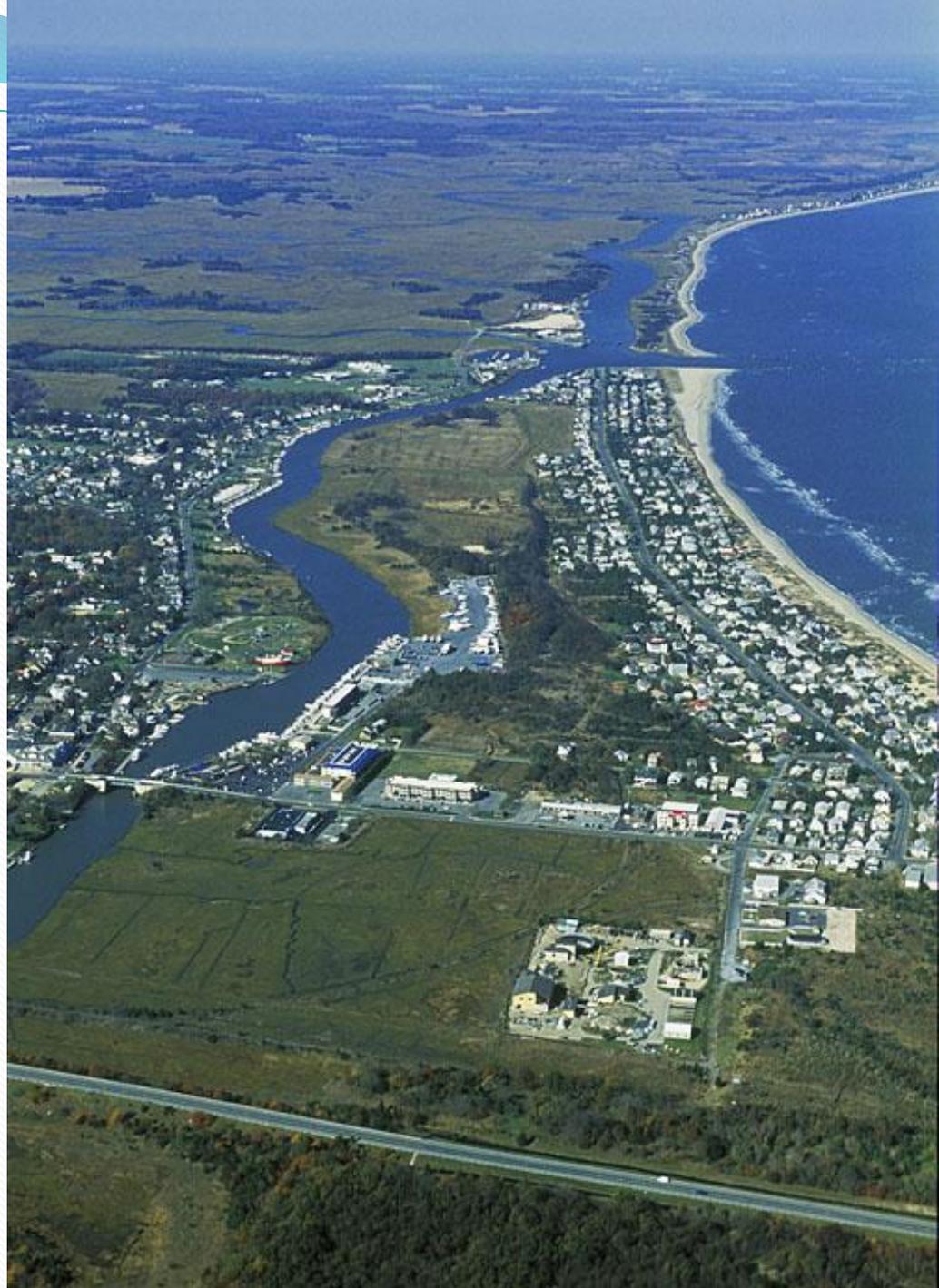
Think about how the community (built, social, natural) is vulnerable to natural hazards and climate change.

Three groups focusing on specific topics for risk and vulnerability identification:

- 1) Natural hazards and critical facilities.
- 2) Societal and economic risk.
- 3) Environmental resources / environmental hazards.

Discussion and mapping activity:

- 1) Identify hazards or climate conditions of concern.
- 2) Denote types of vulnerable people, places, or infrastructure.
- 3) Are certain regions more vulnerable than others?
- 4) Identify data gaps / information needs.
- 5) Opportunities to address vulnerabilities?



# Vulnerability Self-Assessment

## Self-Assessment

- Critical Facilities; Infrastructure
- Societal Analysis
- Economic Analysis
- Environmental Analysis

## Key Vulnerabilities Identified:

- Homes and land use - Flooding
- City infrastructure - Flooding
- Water resources – Precipitation pattern changes, salt water intrusion, flooding



# **Review/Discuss Best Practices –** Useful Tools and Strategies for Reducing Vulnerability and Building Resilience



# Useful Tools and Strategies – Planning for Future Flood Risk

1. Planning Tools
2. Community Engagement Tools
3. Information Gathering Tools
4. Ecosystem Based Tools
5. Regulatory Tools
6. Economic Tools – Financial Incentives
7. Spending Tools

# \*Community Rating System (CRS)\*

Communities are evaluated on the following four areas:

1. Public Information Activities
2. Mapping and Regulatory Activities
3. Flood Damage Reduction Activities
4. Flood Preparedness Activities

Scores result in flood insurance saving for community residents and businesses.

\* CRS credits may be possible



OMB No. 1660-0022  
Expires: September 30, 2013

National Flood Insurance Program  
Community Rating System

## Coordinator's Manual

FIA-15/2013



FEMA

# Planning Tools

- Use an integrated planning approach; build adaptation and natural hazards into the town's normal planning procedures and documents. \*
- Create a comprehensive watershed management plan for debris, storm drains, tide gates, and culverts, in partnership with appropriate organizations and agencies.
- Incorporate information on sea-level rise into coastal planning and ecosystem restoration projects.
- Increase the use of climate and weather information in managing stormwater/flood risk and individual events. \*

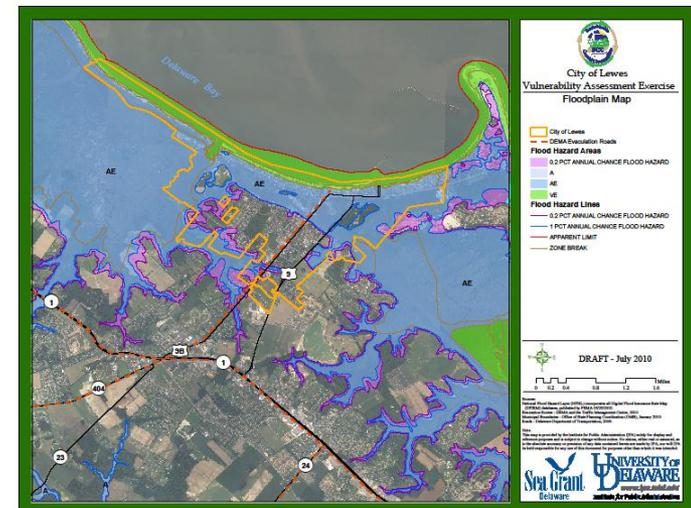
\* Possible CRS Credits

# Example: Integrated Planning Keene, New Hampshire & Lewes, Delaware



- Established a Committee of Department Heads to go through process (inc. Mayor, Chief of Police, etc.).
- Including adaptation and mitigation in Community Visioning and Comprehensive Planning.
- Have created a standard review procedure for the Capital Improvement Program to ensure that decisions consider climate and hazards.

- Decided in 2011 to include climate adaptation and hazard mitigation in the comprehensive planning update.
- Working to further determine how exactly to articulate their goals in the document.
- Mitigation Planning Team meets quarterly.



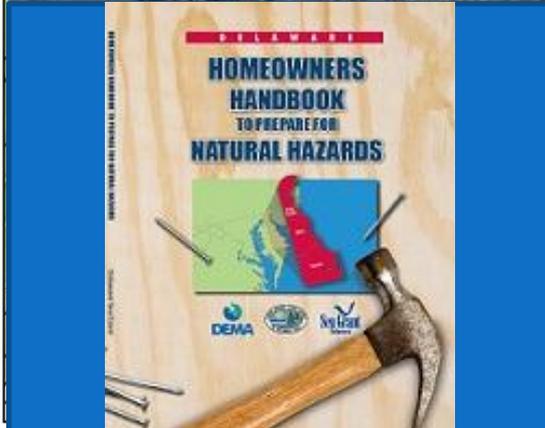
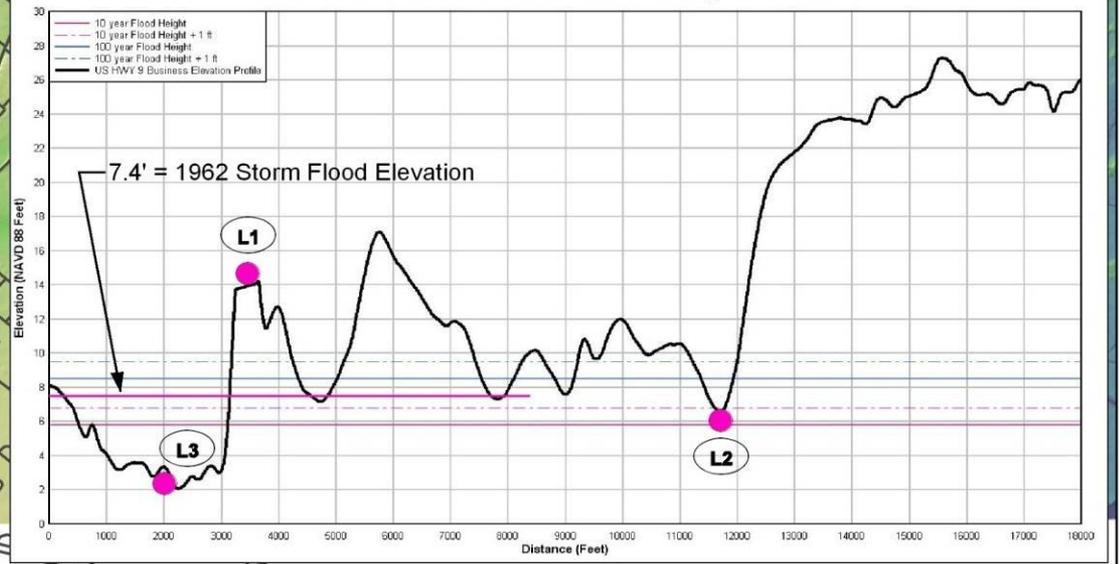
# Community Engagement Tools

- Improve outreach and education particularly focused on successful behavior changes by community residents.\*
- Promote on-site water retention and management on residential and commercial properties.
- Establish a *Mitigation Planning Team* to establish an ongoing mitigation program for the community.
- Develop signage along the waterfront to show citizens and tourist the flood threat.\*

\* Possible CRS Credits



US HWY 9 Business Elevation Profile with Flood Heights - Lewes Beach



# Flood Risk Awareness - Inundation Depth Mapping

(project in progress)



*Map courtesy Mark Nardi, USGS; DNREC, DESG, AMEX*

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(project in progress)



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# Flood Risk Awareness - Inundation Mapping



Map courtesy Mark Nardi, USGS; DNREC, DESG, AMEX

# Flood Risk Awareness - Inundation Mapping



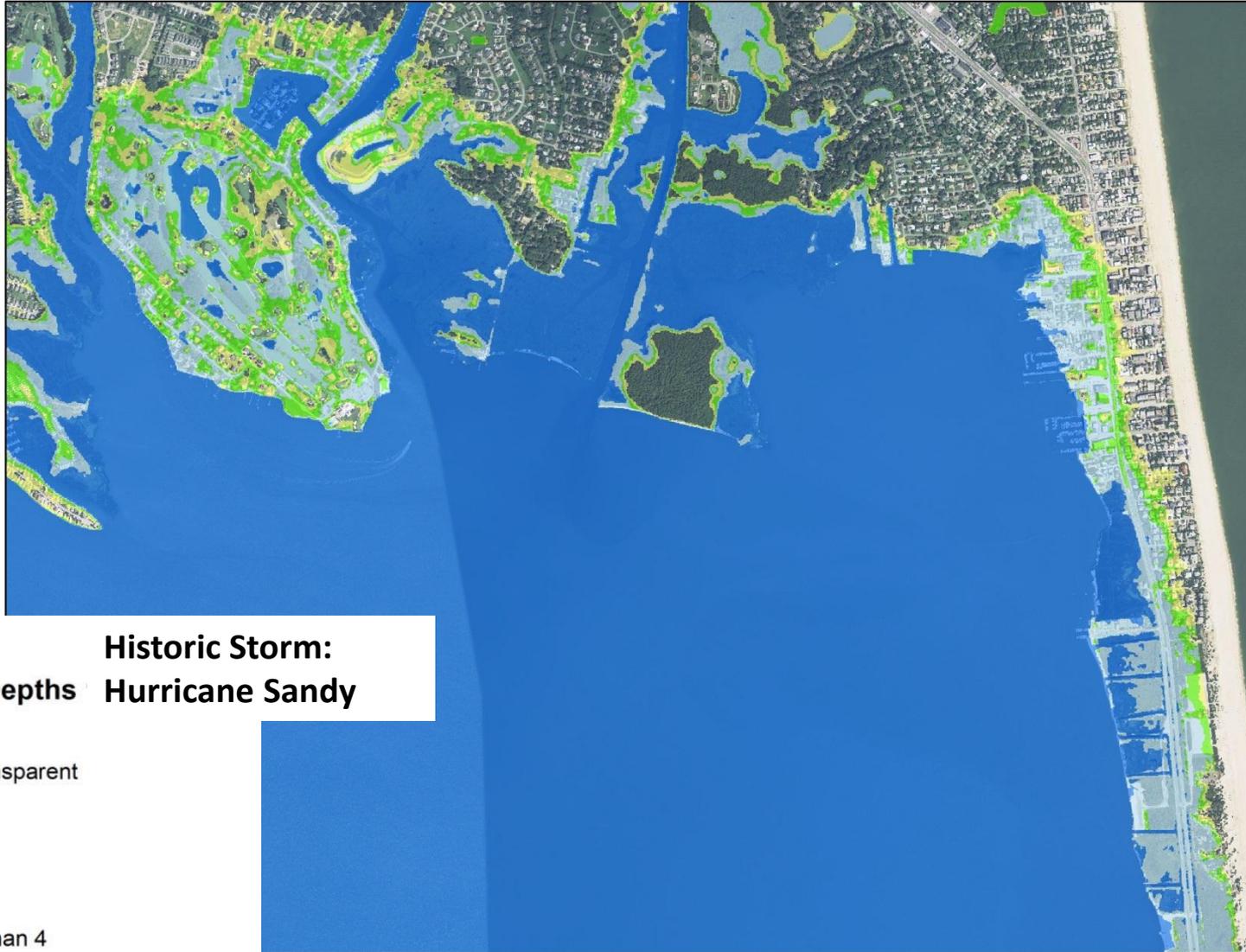
*Map courtesy Mark Nardi, USGS; DNREC, DESG, AMEX*

# Flood Risk Awareness - Inundation Mapping



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# Flood Risk Awareness - Inundation Mapping



Map courtesy Mark Nardi, USGS; DNREC, DESG, AMEX

# Information Gathering Tools

- Evaluate community infrastructure's vulnerability to direct flood impacts, as well as vulnerabilities to indirect flood impacts.\*
- Evaluate approvals of land use in areas that are prone to flooding when changes are proposed.
- Continue to evaluate options for protecting historic structures and waterfront areas.\*
- Continue to evaluate need for public flood protection projects that could include barriers to coastal floodwaters such as temporary flood walls, and improvements to the drainage system such as installation of backflow preventers on storm drain outflows into the river/bay.
- Increase monitoring and control of invasive species.

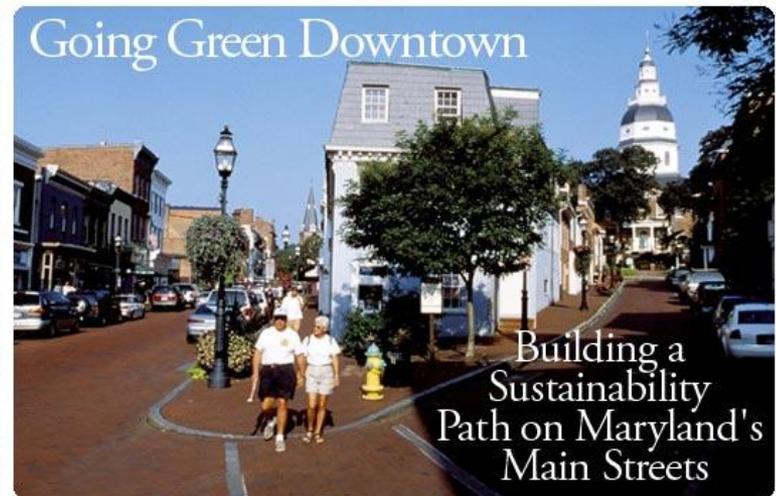
\* Possible CRS Credits

# Example: Improved Data Collection

## Annapolis, MD

In 2011 the City committed to:

- Evaluate risks and vulnerabilities from coastal flooding and sea-level rise in decisions involving land use along the waterfront.
- Evaluate the need and options for protecting historic structures and waterfront areas.
- Periodic review of current and projected sea levels. These should be reviewed on the same cycle as the city's comprehensive plan.



# Ecosystem Tools

- Incorporate low-impact development standards into new developments and community-wide improvements.\*
- Restore the health of some selected wetlands to provide additional natural flood control.\*
- Convert vulnerable land to natural systems to protect people, property and places\*

\* Possible CRS Credits

# Example: Living Shorelines

## Delaware Estuary Living Shoreline Initiative (DELSI)



Photos courtesy Partnership for the Delaware Estuary

- Stabilize eroding shorelines using combination of native wetland plants, natural structures, intertidal shellfish to trap sediment and absorb waves.
- Economical approach to combat the erosion of tidal marshes that provide valuable services.
- Installations planned / on-going :
  - Lewes-Rehoboth Canal (Lewes); Indian River Marina; Dupont Nature Center

# Regulatory Tools

- Change zoning and land use regulations to discourage development in flood hazard areas and reduce investment in at risk areas.\*
- Create a floodplain setback – require that homes be built a minimum distance from the floodplain, river channels, or shorelines.\*
- Manage and regulate development to future risk level, not past. Update flood maps to include future flood risk.\*
- Incorporate review of higher flood-risk impacts to new developments and new construction, especially related to street flooding and evacuation considerations.
- Update building codes to require more flood resistant structures in floodplains.\*

\* Possible CRS Credits

# Example: Regulatory Tool

## Norfolk, Virginia



- Keenly aware of the problem:
  - Regularly sees tidal flooding.
  - Some neighborhoods 8 + days a month.
- Considering zoning changes:
  - Areas vulnerable to flooding → parks and open space providing more water access.
  - Creating retreat zones – safer inland areas where people who will not be allowed to rebuild can move to.
- Elevating a road and rerouting all the areas storm drains:
  - Cost – \$1 million.

# Economic Tools – Financial Incentives

- Create incentives to encourage homeowners to design and build homes in safer locations and safer ways. For example, establish financial incentives to encourage homeowners to build new homes above the required base flood elevation.
- Establish financial assistance or incentives and help encourage retrofitting of structures that do not meet flood-proofing or elevation standards.

# Example: Incentive Program Hull, Massachusetts

- The Board of Selectman unanimously passed a freeboard incentive - gives citizens up to \$500 in building permit fees if the builder elevates the home 2 feet above the current highest standard.



# Spending Tools

- Purchase land in vulnerable locations.\*
- Identify and fund drainage improvement projects. Specifically measures that reduce street flooding during rain events.\*
- Raise or elevate infrastructure to protect it from flooding.\*
- Enhance shoreline protection where retreat and accommodation are not possible.

\* Possible CRS Credits

# Example: Spending Tool – Land Acquisition

## Bowers Beach, DE



Picture and information retrieved from <http://delaware.newszap.com/centraldelaware/113935-70/new-bowers-beach-park>

- Private property flooded repeatedly from storms.
- Owner sought help from DNREC to lift the house, but it wasn't feasible.
- DNREC, FEMA, and town worked together to purchase the land.
- The end result: Main Street Park.

# Example: Spending Tool – Land Acquisition

## Glennville, DE



Glennville, DE home after the flood



Glennville, DE after buy-out

- Glennville, DE was destroyed by a flash flood in 2003.
- State and county governments purchased 171 homes.
- Area is now a flood plain that protects neighboring communities.

# Identify Potential Actions to Reduce Vulnerabilities

What works best for your community?

Synthesize list of best practices and evaluate community capacity to implement:

- Local plans and regulations
- Structure and infrastructure projects
- Natural systems protection
- Education/awareness programs

Obtain input and feedback via:

- Surveys
- Public meetings
- Committees / commissions
- Consultants



# Assess/Review Community Capabilities to Address Hazards/Vulnerabilities

## Cost, Feasibility, Timing, Practicality

Planning: coordinate with timing / cycle of rewrites and revisions;

Floodplain management plan updates: consider higher standards?

Regulations and ordinances: coordinate with building / zoning code updates?

Resources: staff and funding

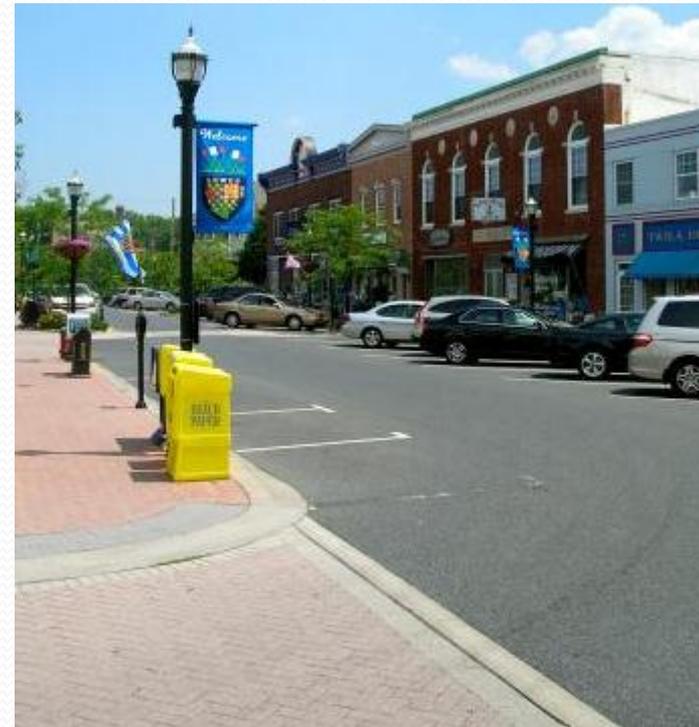
Availability of data?



# Identified Strategies

Used the follow criteria to select the primary actions:

- Social
- Political
- Technical
- Economic
- Administrative
- Environmental





# Creating Action / Achieving Implementation

What additional information is needed to implement the selected actions?

Consideration/components of an implementation plan:

- ✓ Alignment with existing priorities
- ✓ Administration and staffing
  - Primary person responsible
  - Additional staff involved
- ✓ Implementation steps
  - Sub-steps needed to accomplish task
- ✓ Proposed timeline
- ✓ Key funding sources (if necessary)
  - Plan to gain access to funding
- ✓ Monitoring



# Connections and Co-Benefits

## Flood Hazard Mitigation Planning and Adaptation Strategies

The tools used to manage growth, mitigate hazards, increase efficiency and effectiveness of infrastructure, protect natural resources, promote public health, etc. are the same tools needed to address future flood hazards.

### Role of the Lewes Mitigation Planning Team

- Provided project guidance and participated in workshops
- Reviewed and approved steps in the project
- Provided additional information and data as needed
- Keepers of the report
- Assist and ensure implementation (implementation plans provided)
- Tracking success of the projects

# Community Planning Project - Objectives and Outcomes

1. Increase overall awareness— current and future flood risks.
2. Enhance the understanding of the community's vulnerability to future flood risk, and identify data gaps.
3. Utilize a prioritization system to select flood hazard mitigation / adaptation strategies from national best practices for communities.
4. Design a methodology that combines hazard mitigation planning and climate change adaptation, enabling the community to engage in a combined planning effort in the future.
5. Create a final action plan that the community can use to implement the chosen initiatives.

# What Can a Community Official Do to Reduce Future Flood Risk?

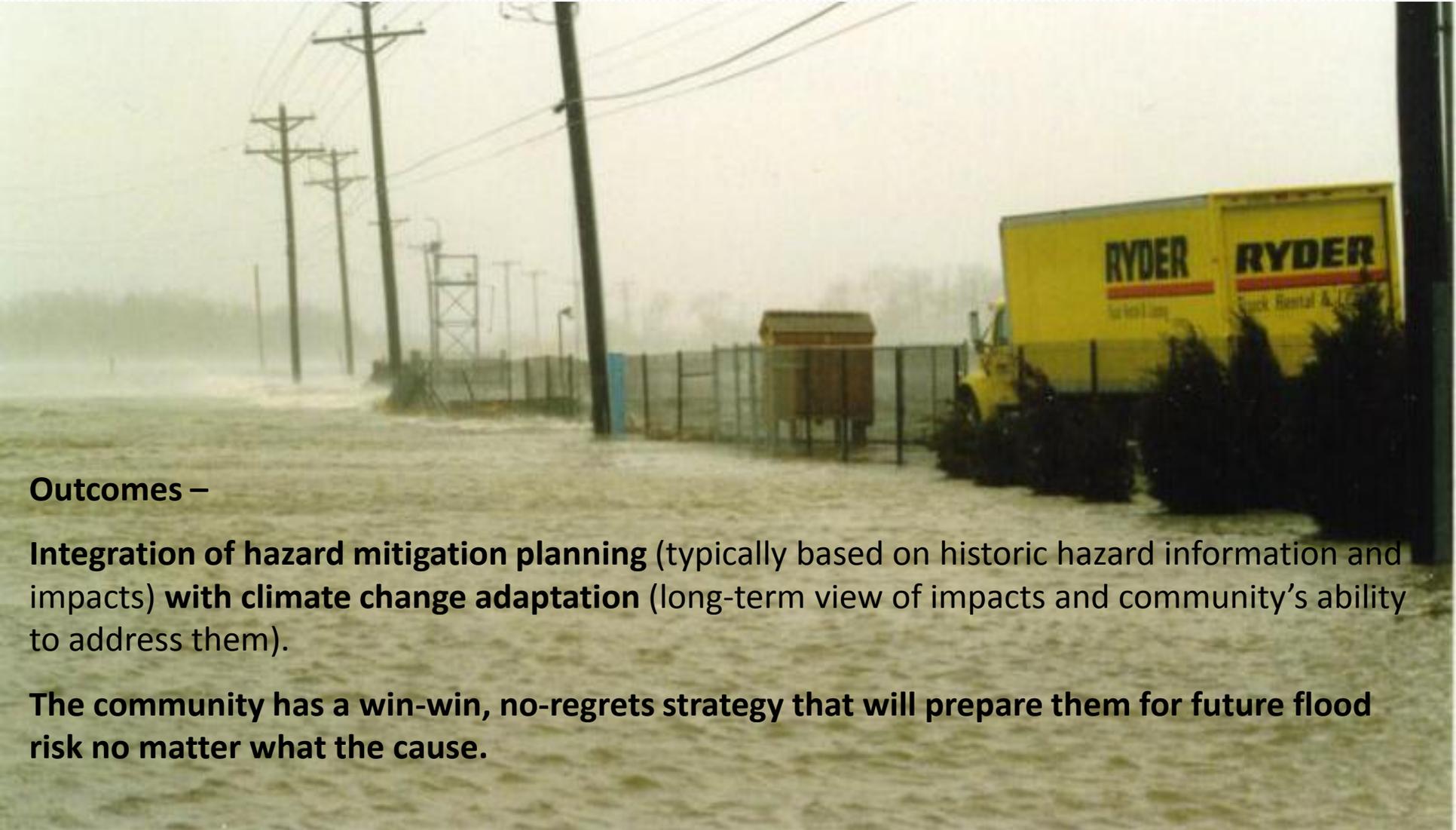
**Plan** –participate in development of a mitigation/adaptation action plan; research best practices and benefits of higher standards.

**Initiate** – integrate adaptation policies/strategies into existing planning documents; encourage / facilitate implement of identified actions.

**Communicate** – support adoption of higher standards; champion mitigation/adaptation action planning goals.



# Planning for Future Flood Risk



## Outcomes –

**Integration of hazard mitigation planning** (typically based on historic hazard information and impacts) **with climate change adaptation** (long-term view of impacts and community's ability to address them).

**The community has a win-win, no-regrets strategy that will prepare them for future flood risk no matter what the cause.**

# Questions?



Photo courtesy Jon Beeson



Photo courtesy DNREC

