COMMUNITY PLANNING & DEVELOPMENT

# Harnessing Ecosystem Services for Water Management

*Climate Resilience Webinar Series*

U.S. Department of Housing and Urban Development

# Disclaimer

- This presentation is intended to provide communities and states with the tools and information to help in climate resilience planning and activities.
- Information presented in this webinar is independent of the Notice of Funding Availability (NOFA) for the National Disaster Resilience Competition (NDRC). While we expect that this information will be useful to interested communities and eligible applicants, *it should not be construed as the definitive word on any singular approach to resilience*.
- All NOFA NDRC questions should be sent to: resilientrecovery@hud.gov

# Presenters

- *Chad Berginnis, Association of State Floodplain Managers (ASFPM)*
- *Kate White, U.S. Army Corps of Engineers*
- *Bob Newport, U.S. EPA*
- *Joanne Mathews Throwe, University of Maryland Environmental Finance Center*

# Agenda

1. Overview
2. Floodplain Management Overview
3. US Army Corps of Engineers Approach to Coastal Risk Reduction: Full Portfolio of Measures
4. Green Infrastructure
5. Green Infrastructure Financing
6. Questions

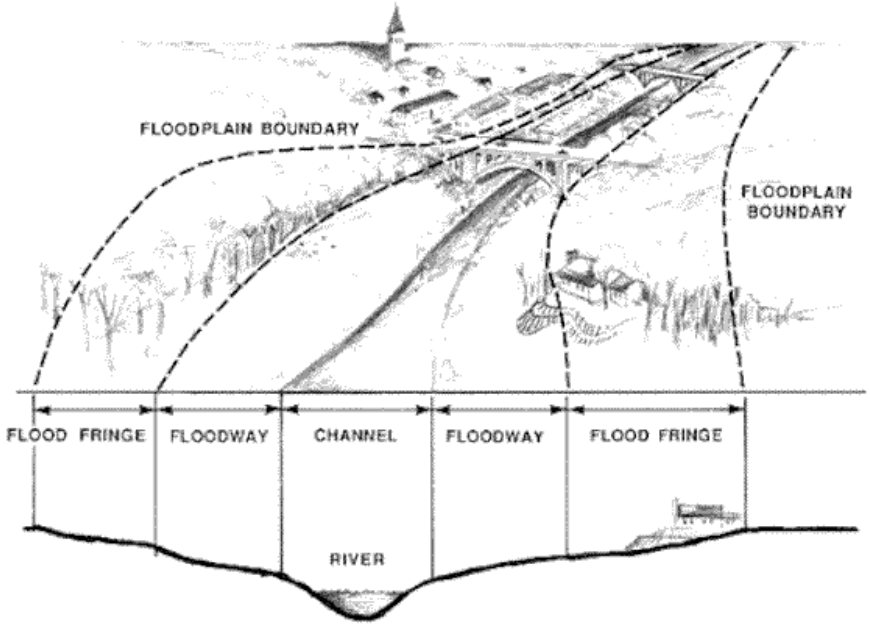
# ASFPM

- National non-profit, professional organization with the mission to reduce flood losses and protecting the natural and beneficial functions of floodplains
- 16,000 members, 35 chapters
- What we do:
  - National CFM certification
  - Develop publications, technical guidance and resources for floodplain managers
  - No Adverse Impact (NAI initiative)
  - Conferences, events and continuing educational training
- floods.org

# Overview of Floodplain Management

***Definition of FPM:*** Wisely using the nations' floodplains to reduce losses and preserving the natural functions of floodplains

***Definition of a resilient community:*** one that is able to resist and rapidly recover from disasters or other shocks with minimal outside assistance.




***Communities with effectively managed floodplains will be resilient from the hazard of flooding.***

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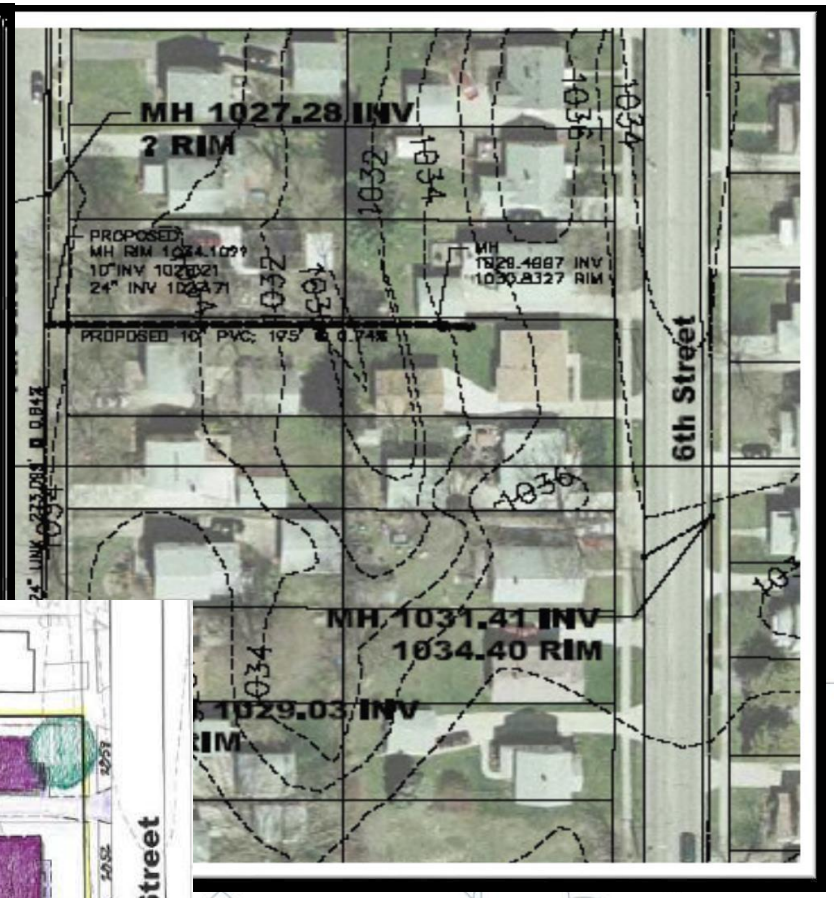
# Strategies and Tools for Floodplain Management

## *#1: Modify Susceptibility to Flood Damages and Disruption*

- ❑ Local and state regulations for flood hazard areas (zoning, subdivision, FPM regulations; building, housing, sanitary codes)
- ❑ Acquisition/relocation
- ❑ Floodproofing (elevation, dry/wet floodproofing)
- ❑ Development and redevelopment policies
- ❑ Flood forecasting and warning systems
- ❑ Information and education

# Cuyahoga Falls, OH







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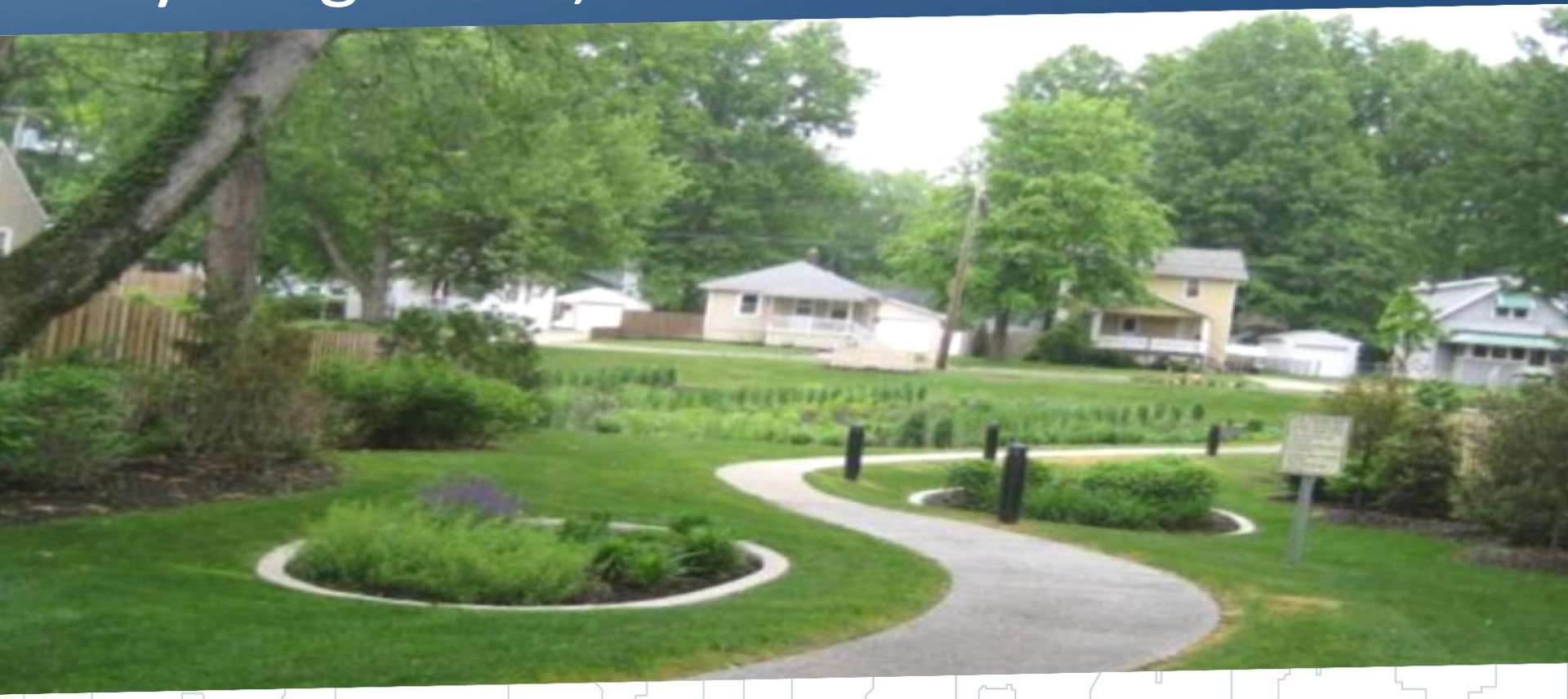
# Cuyahoga Falls, OH



Acquisition and demolition of 4 floodprone homes. Instead of seeding and grading land, a community park and rain garden was created. Withstood heaving, flooding rains in 2014.

# Sandy Affected Area , NJ


Elevation of a building is a common technique across the United States.

# Strategies and Tools for Floodplain Management

***#2: Modify Flooding***

- ❑ Dams and reservoirs
- ❑ Dikes, levees, and floodwalls
- ❑ Channel alterations
- ❑ High flow diversions
- ❑ Land treatment measures
- ❑ On-site detention measures

Is this approach resilient?

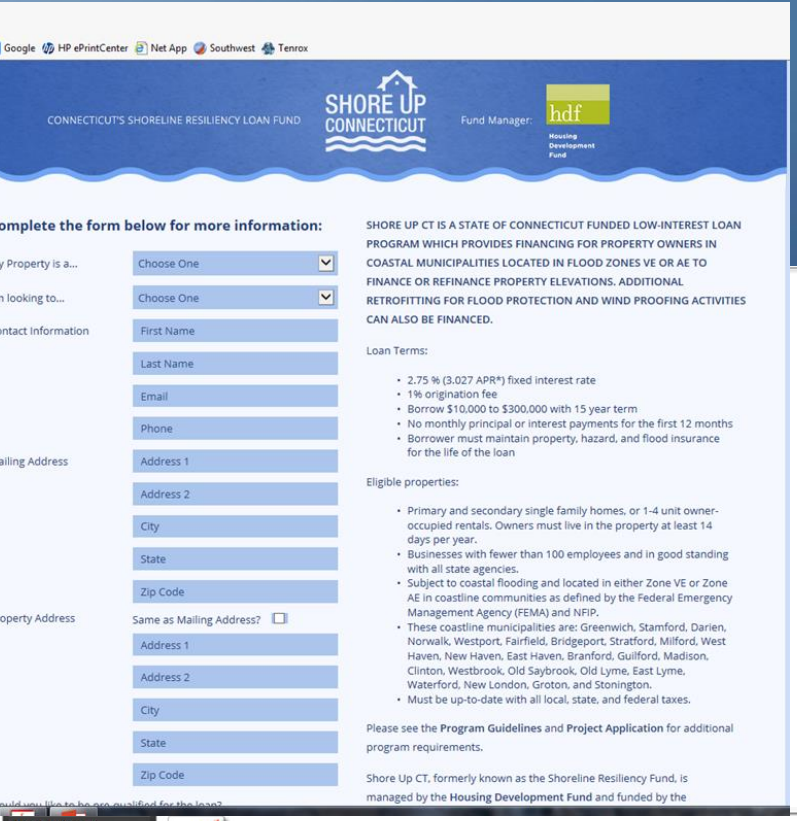
# Yuba City, CA

Setting back 9,600 feet of levee reconnected 600 acres of floodplain with the river. New levee provides 200-year protection and reduced flood elevations in the area by 3 feet.

# Strategies and Tools for Floodplain Management

***#3: Modify Impacts of Flooding on Individuals and the Community***

- ❑ Information and education
- ❑ Flood insurance
- ❑ Loan Programs
- ❑ Disaster assistance
- ❑ Tax adjustments
- ❑ Flood emergency measures
- ❑ Pre- and Post-flood recovery planning



Google HP ePrintCenter Net App Southwest Tenrox

CONNECTICUT'S SHORELINE RESILIENCY LOAN FUND

SHORE UP CONNECTICUT

Fund Manager: hdf Housing Development Fund

omplete the form below for more information:

y Property is a... Choose One

n looking to... Choose One

ntact Information

First Name

Last Name

Email

Phone

ailing Address

Address 1

Address 2

City

State

Zip Code

operty Address

Same as Mailing Address?

Address 1

Address 2

City

State

Zip Code

SHORE UP CT IS A STATE OF CONNECTICUT FUNDED LOW-INTEREST LOAN PROGRAM WHICH PROVIDES FINANCING FOR PROPERTY OWNERS IN COASTAL MUNICIPALITIES LOCATED IN FLOOD ZONES VE OR AE TO FINANCE OR REFINANCE PROPERTY ELEVATIONS. ADDITIONAL RETROFITTING FOR FLOOD PROTECTION AND WIND PROOFING ACTIVITIES CAN ALSO BE FINANCED.

Loan Terms:

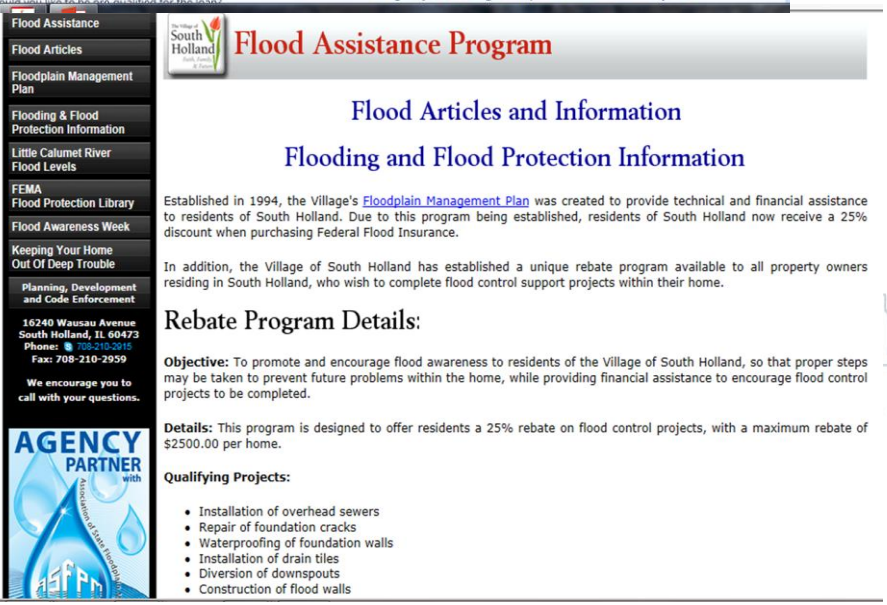
- 2.75 % (3.027 APR*) fixed interest rate
- 1% origination fee
- Borrow $10,000 to $300,000 with 15 year term
- No monthly principal or interest payments for the first 12 months
- Borrower must maintain property, hazard, and flood insurance for the life of the loan

Eligible properties:

- Primary and secondary single family homes, or 1-4 unit owner-occupied rentals. Owners must live in the property at least 14 days per year.
- Businesses with fewer than 100 employees and in good standing with all state agencies.
- Subject to coastal flooding and located in either Zone VE or Zone AE in coastline communities as defined by the Federal Emergency Management Agency (FEMA) and NFIP.
- These coastline municipalities are: Greenwich, Stamford, Darien, Norwalk, Westport, Fairfield, Bridgeport, Stratford, Milford, West Haven, New Haven, East Haven, Branford, Guilford, Madison, Clinton, Westbrook, Old Saybrook, Old Lyme, East Lyme, Waterford, New London, Groton, and Stonington.
- Must be up-to-date with all local, state, and federal taxes.

Please see the **Program Guidelines** and **Project Application** for additional program requirements.

Shore Up CT, formerly known as the Shoreline Resiliency Fund, is managed by the **Housing Development Fund** and funded by the



Flood Assistance

Flood Articles

Floodplain Management Plan

Flooding & Flood Protection Information

Little Calumet River Flood Levels

FEMA Flood Protection Library

Flood Awareness Week

Keeping Your Home Out Of Deep Trouble

Planning, Development and Code Enforcement

16240 Wausau Avenue
South Holland, IL 60473
Phone: 708-210-2915
Fax: 708-210-2959

We encourage you to call with your questions.

AGENCY PARTNER with

Flood Assistance Program

## Flood Articles and Information

## Flooding and Flood Protection Information

Established in 1994, the Village's Floodplain Management Plan was created to provide technical and financial assistance to residents of South Holland. Due to this program being established, residents of South Holland now receive a 25% discount when purchasing Federal Flood Insurance.

In addition, the Village of South Holland has established a unique rebate program available to all property owners residing in South Holland, who wish to complete flood control support projects within their home.

### Rebate Program Details:

**Objective:** To promote and encourage flood awareness to residents of the Village of South Holland, so that proper steps may be taken to prevent future problems within the home, while providing financial assistance to encourage flood control projects to be completed.

**Details:** This program is designed to offer residents a 25% rebate on flood control projects, with a maximum rebate of $2500.00 per home.

**Qualifying Projects:**

- Installation of overhead sewers
- Repair of foundation cracks
- Waterproofing of foundation walls
- Installation of drain tiles
- Diversion of downspouts
- Construction of flood walls

NATIONAL FLOOD INSURANCE PROGRAM

Colorado Department of Revenue
Taxpayer Service Division
12/13

FYI FOR YOUR INFORMATION

## Income 65
## Wildfire Mitigation Measures Subtraction

**GENERAL INFORMATION**

Individuals, estates and trusts may subtract from their federal taxable income certain costs incurred while performing wildfire mitigation measures on their property.

**LIMITATIONS**

- The taxpayer must own the property upon which the wildfire mitigation measures are performed.
- The property must be located in Colorado and within a wild land-urban interface area.
- For tax years 2009 through 2012 only, the wildfire mitigation measures must be authorized by a community wildfire protection plan adopted by a local government within the interface area.
- The total amount of the subtraction cannot exceed $2,500 or the owner's federal taxable income, whichever is less.
- The deduction is available for tax years 2009 through 2024.

States and communities can develop programs to provide assistance, supplementing programs like the NFIP.

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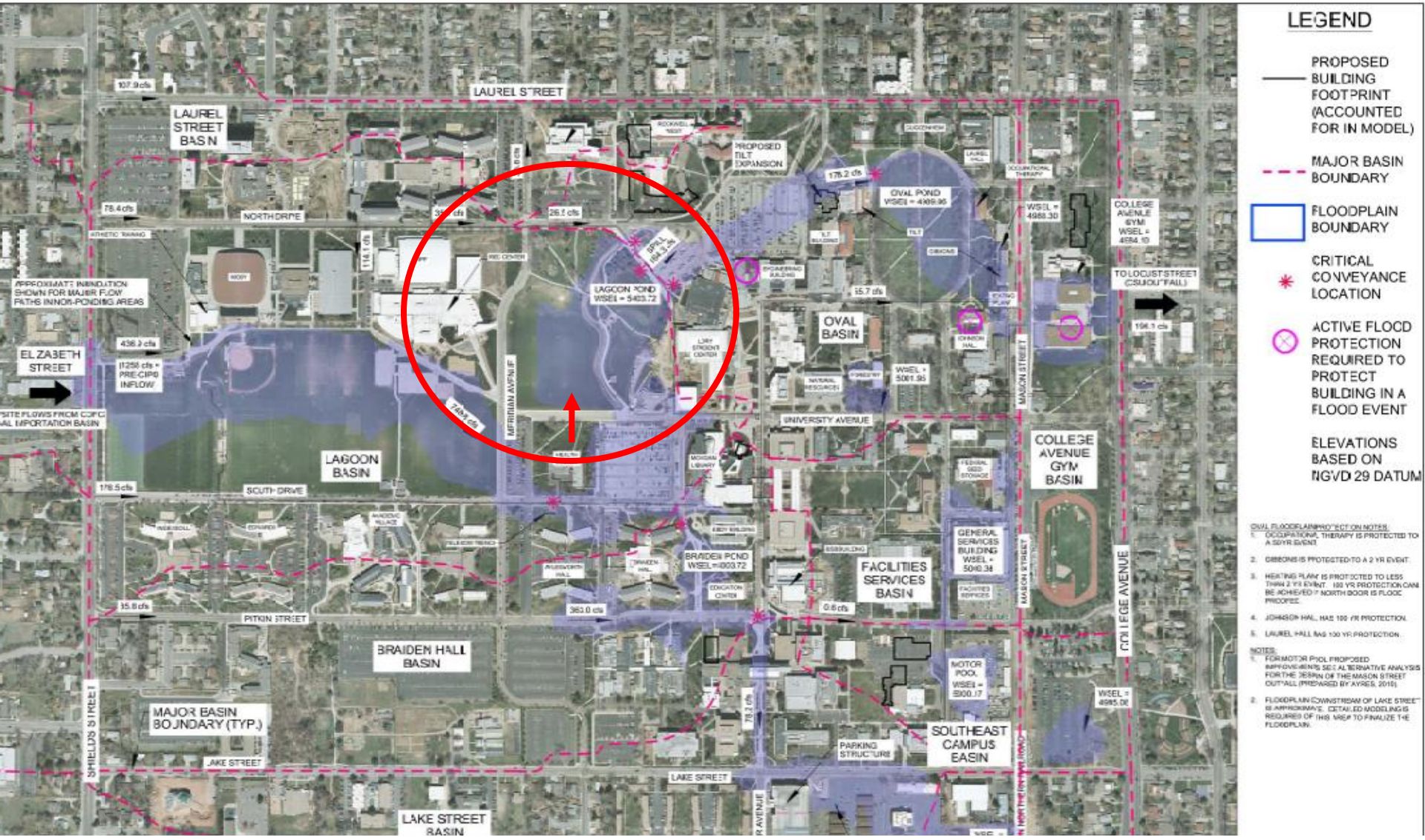
# Strategies and Tools for Floodplain Management

***#4: Protect and Restore the Resources and Functions of Floodplains***

- ❑ Floodplain, wetland, and coastal barrier regulations
- ❑ Land use planning
- ❑ Conservation easements
- ❑ Open space management
- ❑ Multi-objective management
- ❑ Development and redevelopment policies
- ❑ Tax adjustments
- ❑ Information and education

# CSU Campus, Fort Collins, CO



# CSU Campus, Fort Collins, CO

Land contouring to lower the ground elevation by over 6 feet to create additional floodplain storage. Floodplain areas are open green space and soccer fields for recreational use.

# US Army Corps of Engineers Approach to Coastal Risk Reduction: Full Portfolio of Measures

Kate White, PhD, PE
US Army Corps of Engineers

# Outline

Considerations for Adaptation Measures

- Implications of approaches
- Adaptation continuum
- Long-range planning and implementation

It's Not All About Extremes

- Continued development in vulnerable areas
- Potential changes in sea level and storm conditions
- Constrained economic conditions

Measures

- Natural and nature-Based
- Nonstructural
- Structural
- Combinations

# Implications of Adaptation Approaches

"There are trade-offs between the goals of building resilience and reducing vulnerability. Adaptive management approaches that promote resilience seek to learn from failure and promote the ongoing structures and functions of overall systems. Vulnerability approaches, by contrast, focus on the most endangered individuals or ecosystems and seek adaptations that protect those, perhaps at the expense of robustness and resilience of the overall system…." – Adger et al 2009

**Desired Adaptation Space**

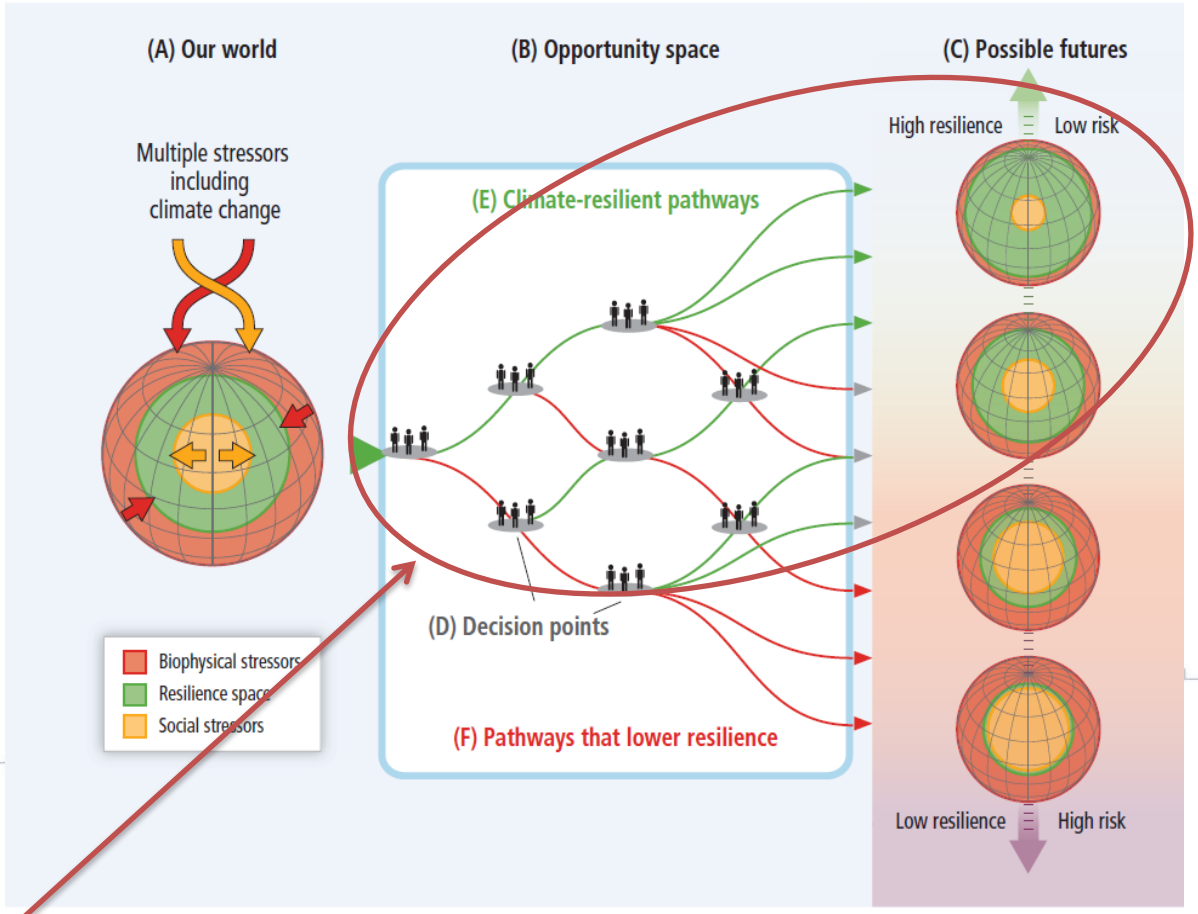
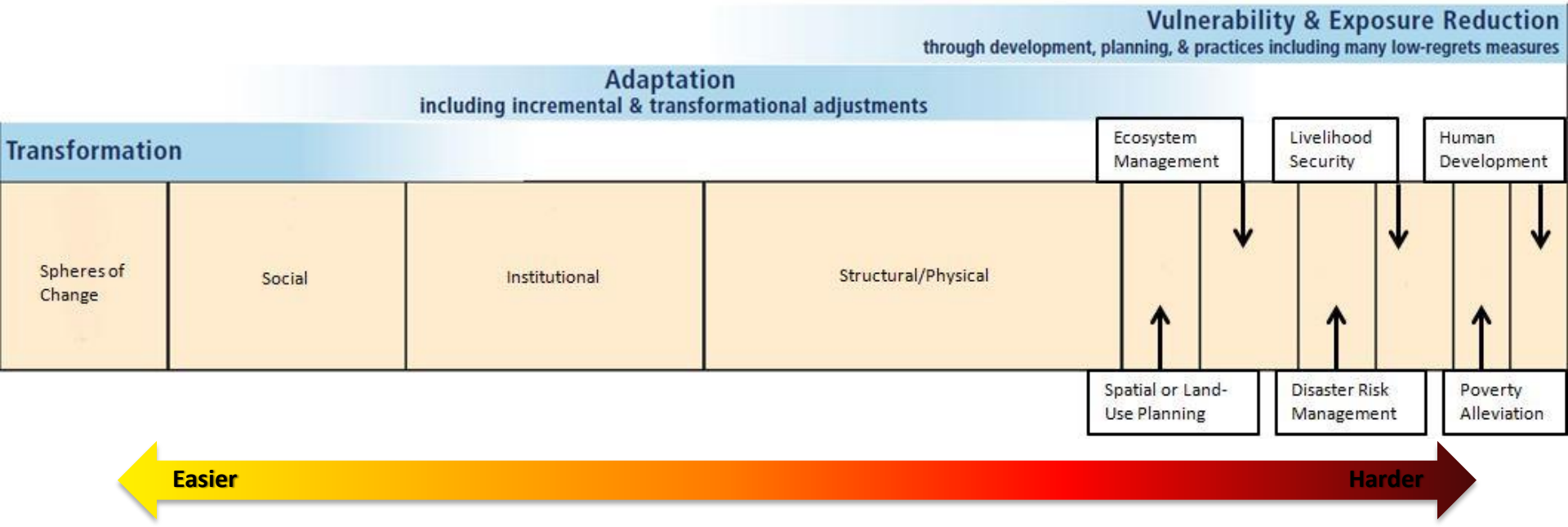



**Figure SPM.9** | Opportunity space and climate-resilient pathways. (A) Our world [Sections A-1 and B-1] is threatened by multiple stressors that impinge on resilience from many directions, represented here simply as biophysical and social stressors. Stressors include climate change, climate variability, land-use change, degradation of ecosystems, poverty and inequality, and cultural factors. (B) Opportunity space [Sections A-2, A-3, B-2, C-1, and C-2] refers to decision points and pathways that lead to a range of (C) possible futures [Sections C and B-3] with differing levels of resilience and risk. (D) Decision points result in actions or failures-to-act throughout the opportunity space, and together they constitute the process of managing or failing to manage risks related to climate change. (E) Climate-resilient pathways (in green) within the opportunity space lead to a more resilient world through adaptive learning, increasing scientific knowledge, effective adaptation and mitigation measures, and other choices that reduce risks. (F) Pathways that lower resilience (in red) can involve insufficient mitigation, maladaptation, failure to learn and use knowledge, and other actions that lower resilience; and they can be irreversible in terms of possible futures.

# Adaptation Continuum (Notional Additions to IPCC AR5 WGII)

**May be more feasible for communities with low technology and less- developed economies**

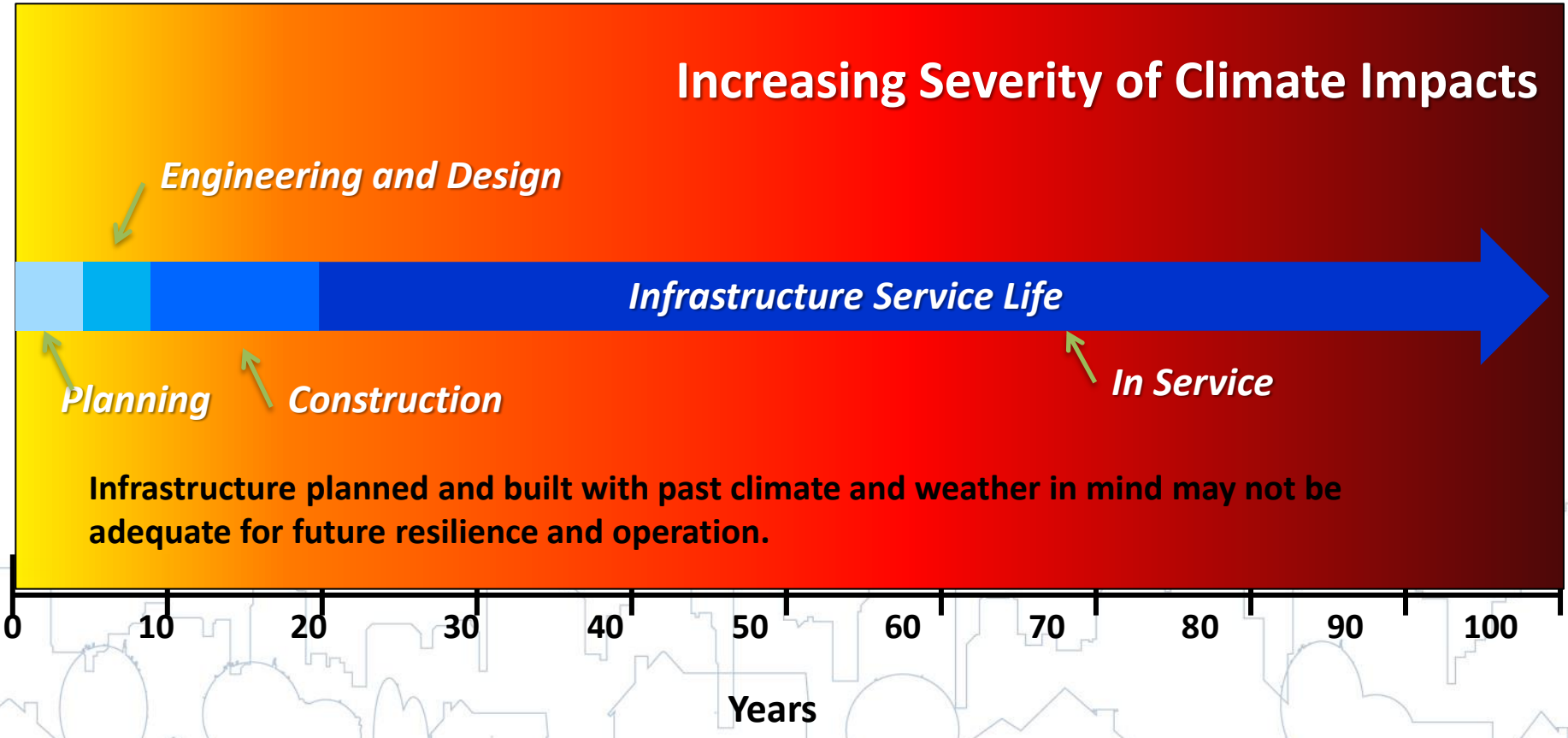
**May be more feasible for communities with high technology and well- developed economies**




**May be easier to implement for regions with low diversity, coherent governance, or smaller geographic scale**

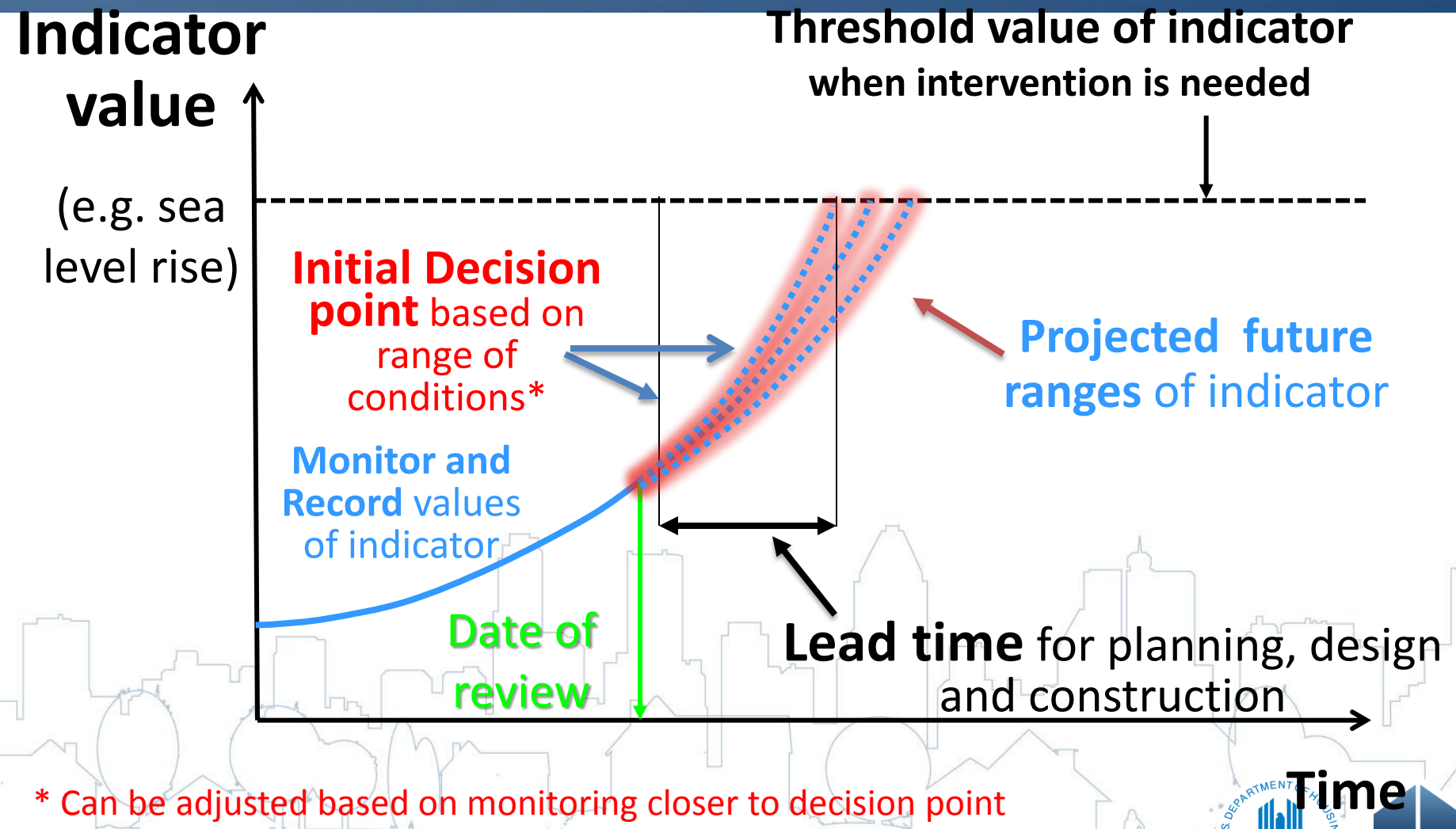
**May be more difficult to implement for regions with high diversity, fragmented governance, or large geographic scale**

# Long-Range Planning and Implementation




After United States Ports: Addressing the Adaptation Challenge, Mr. Mike Savonis

# Preparing for the Long Term: When to Make Decisions?




* Can be adjusted based on monitoring closer to decision point

# It's Not All About Extremes → Continuum of Opportunities

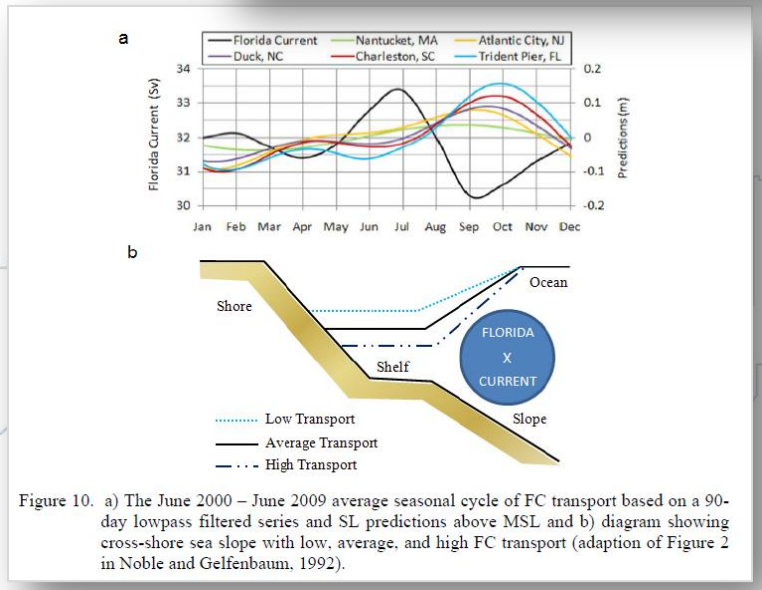



Figure 10. a) The June 2000 – June 2009 average seasonal cycle of FC transport based on a 90-day lowpass filtered series and SL predictions above MSL and b) diagram showing cross-shore sea slope with low, average, and high FC transport (adaption of Figure 2 in Noble and Gelfenbaum, 1992).

"Sea level along much of the eastern U.S. was higher than normal for much of June and July 2009, enough to cause significant attention from coastal communities because of the lack of coastal storms that normally cause such anomalies...."

"… unique in that the NE winds were not at a multi-year high or the Florida Current transport at its low. But the coupled effect of the two forces created SL residuals that were at highest levels all along the East Coast."

tidesandcurrents.noaa.gov

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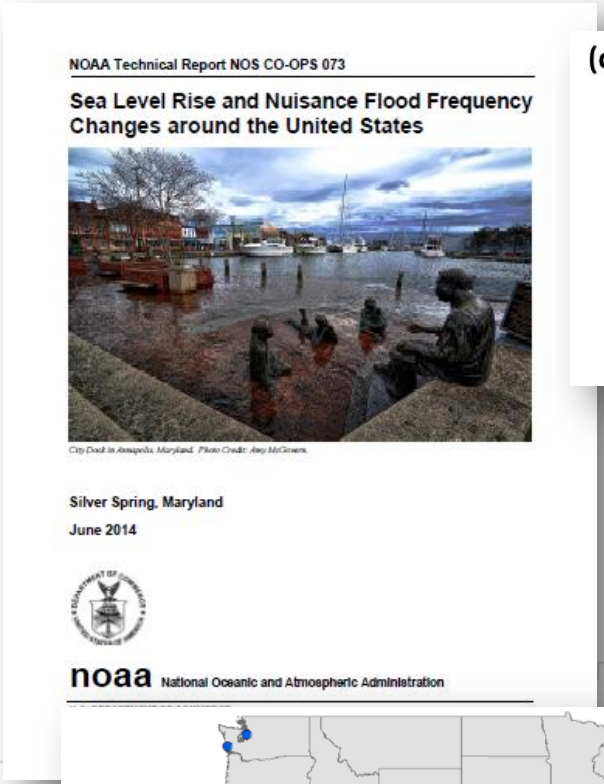
# It's Not All About Extremes → Nuisance Flooding


NOAA Technical Report NOS CO-OPS 073

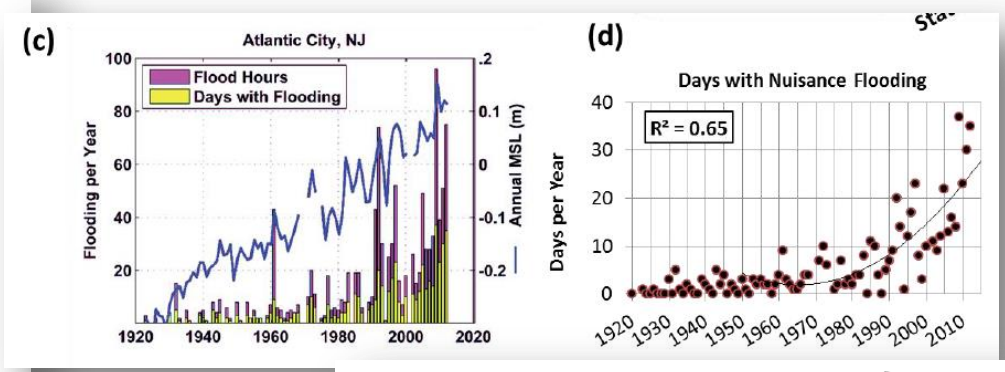
Sea Level Rise and Nuisance Flood Frequency Changes around the United States

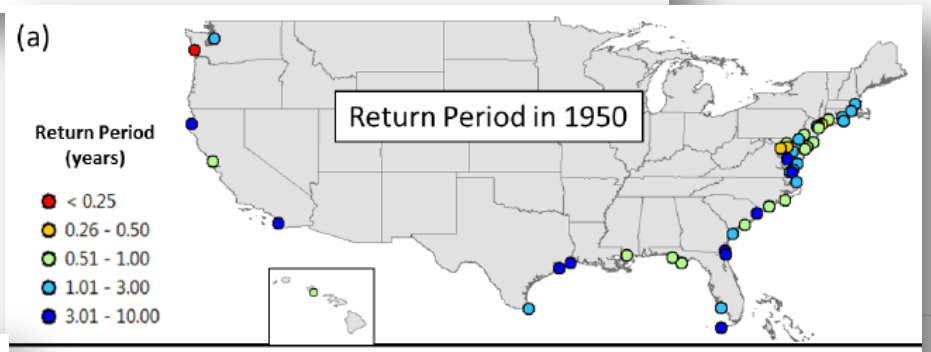
City Dock in Annapolis, Maryland. Photo Credit: Amy McGovern.

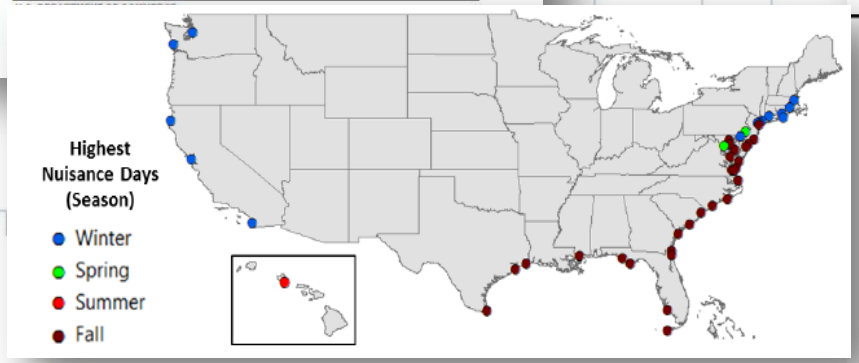
Silver Spring, Maryland

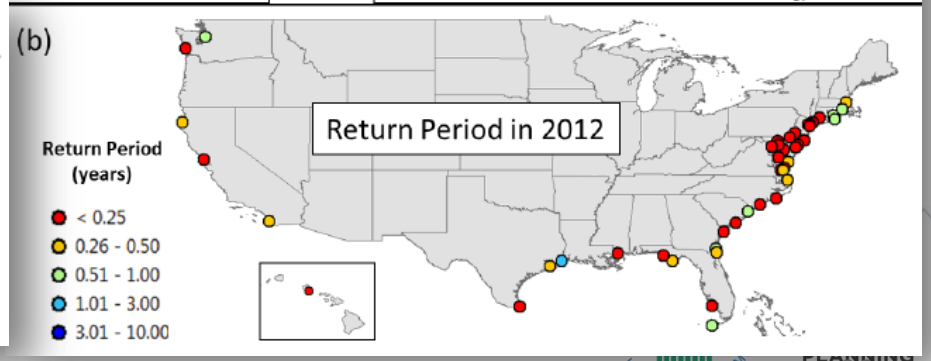
June 2014

noaa National Oceanic and Atmospheric Administration




tidesandcurrents.noaa.gov

# Integrated Approaches Aren't New

Jadwin Report after Flood of 1927

- Require floodplains to carry flow, robust to floods of 2011

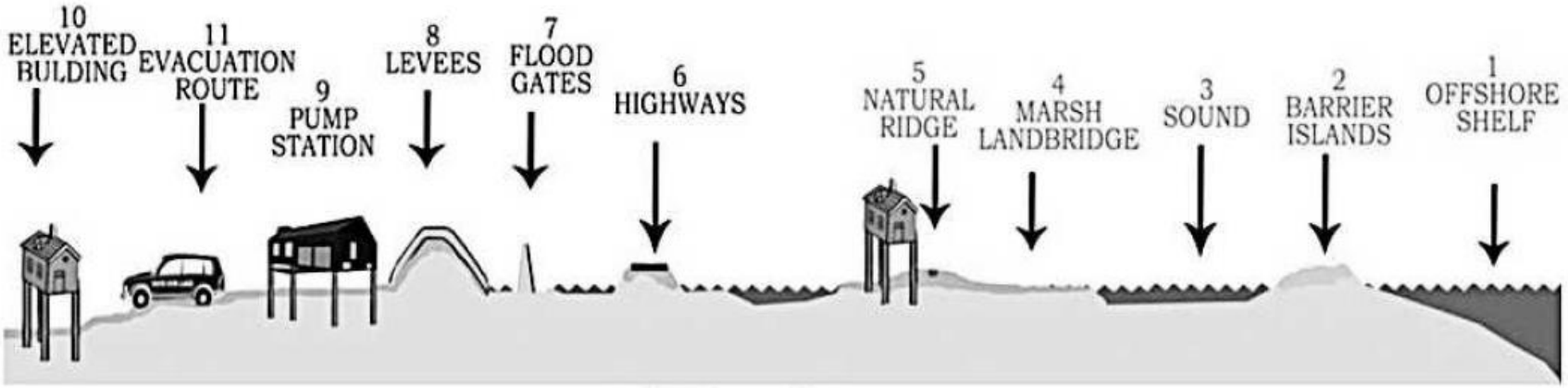
Mississippi Coastal Improvement Project after Katrina

- Increased coastal community resiliency
- Restoration of barrier and near-shore islands enhances protection of mainland areas.
- Moving private lands into the public sector reduces impacts of future storms and hurricanes and increases resiliency and sustainability

Natural and nature-based measures can improve the quality and resilience of economic, ecologic, and social systems

Multiple lines of defense with components addressing different threats support creative and comprehensive approaches

# Full Portfolio = Multiple Lines of Defense




Quantification of performance of natural and nature-based coastal risk reduction measures is a critical knowledge gap

Lopez, J.A. (2009) JCR The Multiple Lines of Defense Strategy to Sustain Coastal Louisiana

# Natural and Nature-Based Infrastructure at a Glance

**GENERAL COASTAL RISK REDUCTION PERFORMANCE FACTORS:**
**STORM INTENSITY, TRACK, AND FORWARD SPEED; SURROUNDING LOCAL BATHYMETRY AND TOPOGRAPHY**





| Dunes and Beaches | Vegetated Features | Oyster and Coral Reefs | Barrier Islands | Maritime Forests/Shrub Communities |
|---|---|---|---|---|
| **Benefits/Processes** | **Benefits/Processes** | **Benefits/Processes** | **Benefits/Processes** | **Benefits/Processes** |
| Breaking of offshore waves | Breaking of offshore waves | Breaking of offshore waves | Wave attenuation and/or dissipation | Wave attenuation and/or dissipation |
| Attenuation of wave energy | Attenuation of wave energy | Attenuation of wave energy | Sediment stabilization | Shoreline erosion stabilization |
| Slow inland water transfer | Slow inland water transfer | Slow inland water transfer | | Soil retention |
| | Increased infiltration | | | |
| **Performance Factors** | **Performance Factors** | **Performance Factors** | **Performance Factors** | **Performance Factors** |
| Berm height and width | Marsh, wetland, or SAV elevation and continuity | Reef width, elevation, and roughness | Island elevation, length, and width | Vegetation height and density |
| Beach slope | Vegetation type and density | | Land cover | Forest dimension |
| Sediment grain size and supply | | | Breach susceptibility | Sediment composition |
| Dune height, crest, and width | | | Proximity to mainland shore | Platform elevation |
| Presence of vegetation | | | | |

# Nonstructural and Floodproofing Measures at a Glance

**GENERAL COASTAL RISK REDUCTION PERFORMANCE FACTORS:**
COLLABORATION AND SHARED RESPONSIBILITY FRAMEWORK, WAVE HEIGHT, WATER LEVEL, STORM DURATION

### Floodplain Policy & Management

**Benefits/Processes**

Improved and controlled floodplain development

Reduced opportunity for damages

Improved natural coast environment

**Performance Factors**

Wave height

Water level

Storm Duration

Agency Collaboration

### Floodproofing and Impact Reduction

**Benefits/Processes**

Reduced opportunity for damages

Increased community resiliency

Does not increase flood potential elsewhere

**Performance Factors**

Wave height

Water level

Storm Duration

### Floodproofing and Impact Reduction

**Benefits/Processes**

Reduced opportunity for damages

Increased community resiliency

Does not increase flood potential elsewhere

**Performance Factors**

Wave height

Water level

Storm Duration

### Relocation

**Benefits/Processes**

Reduced opportunity for damages

Does not increase flood potential elsewhere

Improved natural coast environment

**Performance Factors**

Wave height

Water level

Storm Duration

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# Nonstructural and Floodproofing

Nonstructural and floodproofing measures, including coastal zone management, can have a high return on investment and are a valuable part of a systems approach

| Adaptation Strategy | Resiliency/Effectiveness | Cost |
|---|---|---|
|  **Elevate Equipment** on pads or platforms, to a higher floor, to the roof, or to a new elevated building. |   | $$$$ |
|  **Flood-Proof Equipment** by replacing pumps with submersible pumps and installing watertight boxes around electrical equipment. |   | $$$ |
|  **Install Static Barrier** across critical flood pathways or around critical areas. |   | $$$ |
|  **Seal Building** with water-tight doors and windows, elevating vents and secondary entrances for access during a flood event. |   | $$ |
|  **Sandbag Temporarily** around doorways, vents, and windows before a surge event. |   | $ |
|  **Install Backup Power** via generators nearby or a plug for a portable generator. | *Does not protect equipment but facilitates rapid service recovery.* | $$$ |