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Hazard Mitigation: Integrating Best Practices into Planning

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Integrating Best Practices into Planning

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American Planning Association

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Report Number 560

Hazard Mitigation: Integrating Best Practices into Planning

What is it?

- FEMA contract with APA to produce PAS Report
- Launched in August 2007, completed May 2010
- FEMA now funding audio-web conference scheduled for March 16, 2011
  - Registration and details at: http://www.planning.org/audioconference/index.htm

Hazard Mitigation: Integrating Best Practices into Planning

What does it contain?

- The role of planners in hazard mitigation
- Explanation of hazard mitigation planning and the Disaster Mitigation Act of 2000
- Integrating hazard mitigation throughout all aspects of the planning process
- Concept of a Safe Growth Audit
- Six case studies
- Overall findings and recommendations

Scenes from Iowa City: 2008

Iowa River viewed from eastern bank

University of Iowa's Advanced Technology Lab (ATL)

Scenes from Iowa City: 2008

University of Iowa along the Iowa River


CAT

Coralville Business District

Cedar Rapids:
Flood debris in neighborhoods near downtown

City Hall at Mays Island

Above photos and statistics below from CedarRapidsFloodStory.com

Cedar Rapids 2008 Flood Statistics

Flood Magnitude

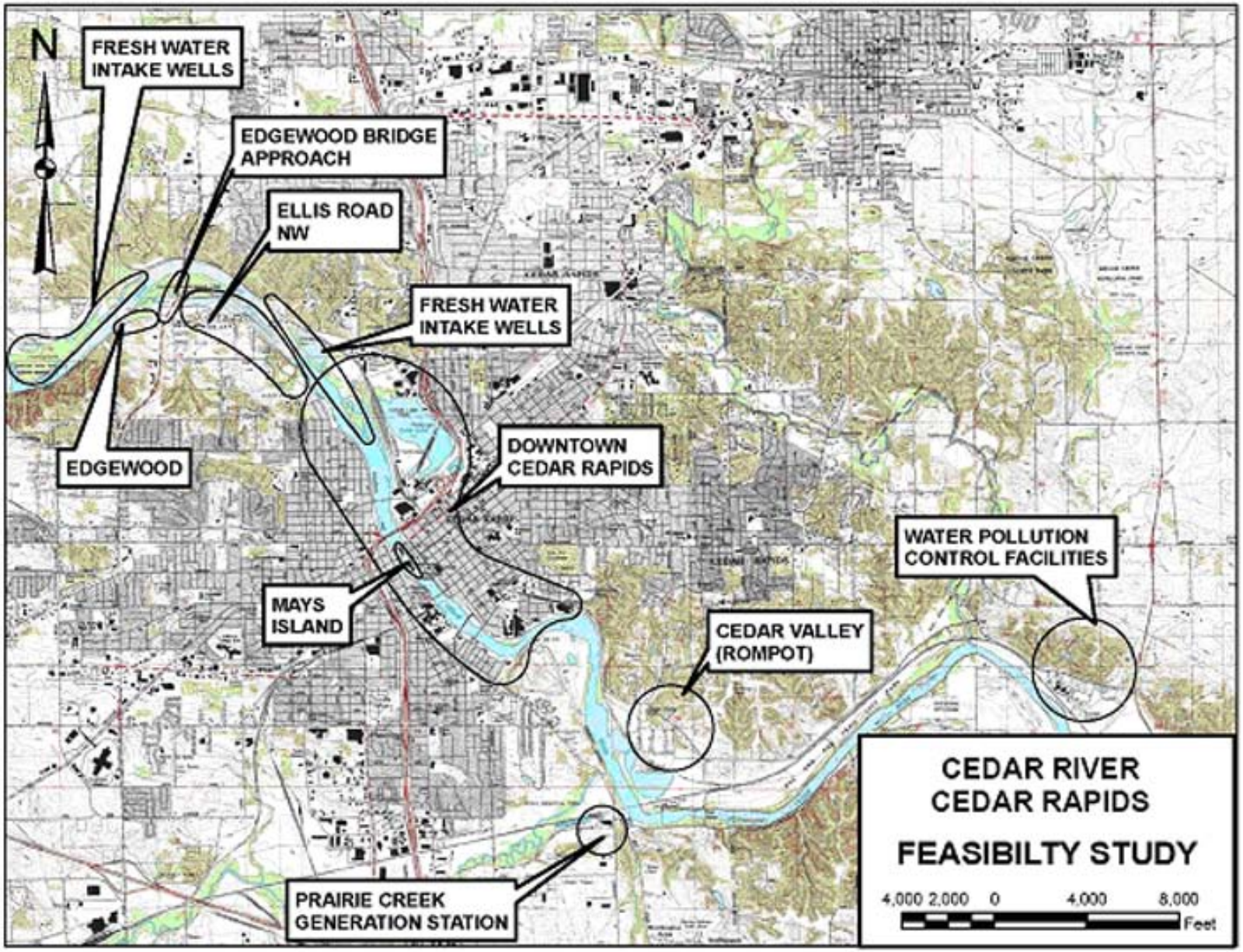
•31.12 feet - Crest of Cedar River on Friday, June 13, 2008
•More than 10 square miles (14%) of the City.
•More than 80,000 tons of debris collected and removed
•Amazingly no flood-related deaths

People

•18,623 estimated persons in flood-impacted area
•120 families in flood areas receiving Section 8 housing assistance
•1,360 estimated job losses as a result of the flood
•More than 57,218 flood recovery-related volunteer hours donated

Property

•7,198 affected parcels (5,390 residential)
•$2.4 billion estimated cost in damage to public infrastructure and future flood management options
•As many as 1,500 properties will be demolished
•86 farms in Linn County damaged


N
FRESH WATER INTAKE WELLS
EDGEWOOD BRIDGE APPROACH
ELLIS ROAD NW
FRESH WATER INTAKE WELLS
EDGEWOOD
DOWNTOWN CEDAR RAPIDS
WATER POLLUTION CONTROL FACILITIES
MAYS ISLAND
CEDAR VALLEY (ROMPOT)
PRAIRIE CREEK GENERATION STATION
CEDAR RIVER
CEDAR RAPIDS
FEASIBILTY STUDY
4,000 2,000 0 4,000 8,000
Feet

Cedar Rapids 2008 Flood Statistics

Impacted Facilities

- City of Cedar Rapids:
  - City Hall, Jail, Municipal Court Facilities, Central Fire, Central Library, and the Police HQ completely flooded and displaced
  - Ground Transportation, municipal city transportation hub, completely displaced
  - 3 of 4 city collector wells and 46 vertical wells disabled
- Linn County
  - 10 damaged Linn County Buildings, including: Administrative Office Building (AOB), Correctional Center, Options of Linn County, AOB Annex, Elections Depot, Sheriff's Office, County Courthouse, Mott Building, Witwer Building and Youth Shelter
- 486 property tax exempt facilities (govt., schools, churches, Red Cross etc.)
- 136 other (utilities and railroads etc...)

Smulekoff's two weeks after the flood

Resilience: This store reopened for business!

Collapsed CRANDIC railroad bridge

Cedar Falls, Iowa, Case Study (2008)

Sign: "Whose City was Saved?"

Flood Buyout Properties
Cedar Falls, Iowa

N
W E
S

0 500 1,000 2,000 3,000 4,000
Feet

Legend

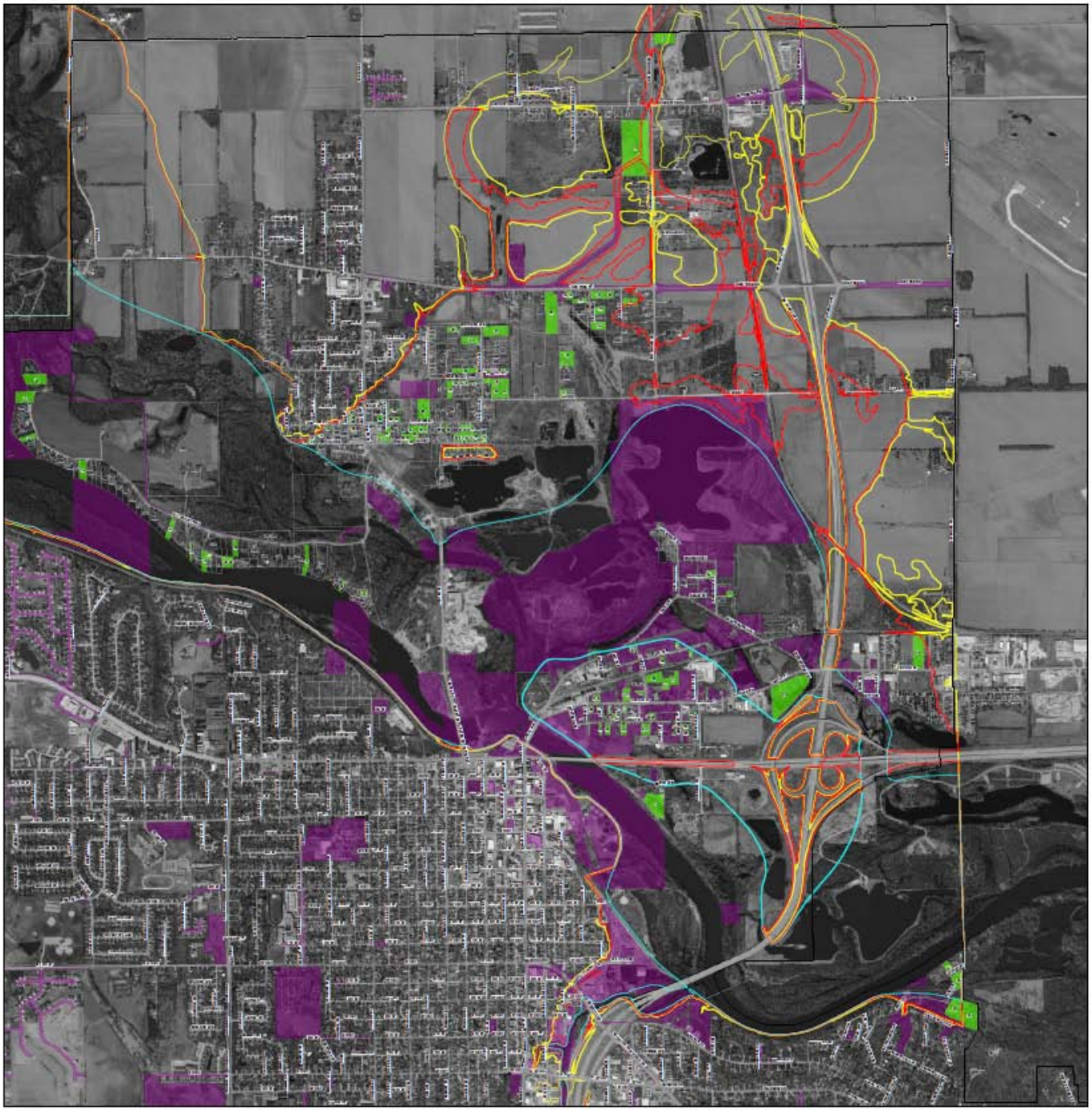
CF_ROADS(SP83)

Submitted FEMA Study

- 100 year
- 500 year
- Floodway
- City-Owned Parcels

Properties:

- In Buyout Program
- Not In Program



American Planning Association
Making Great Communities Happen

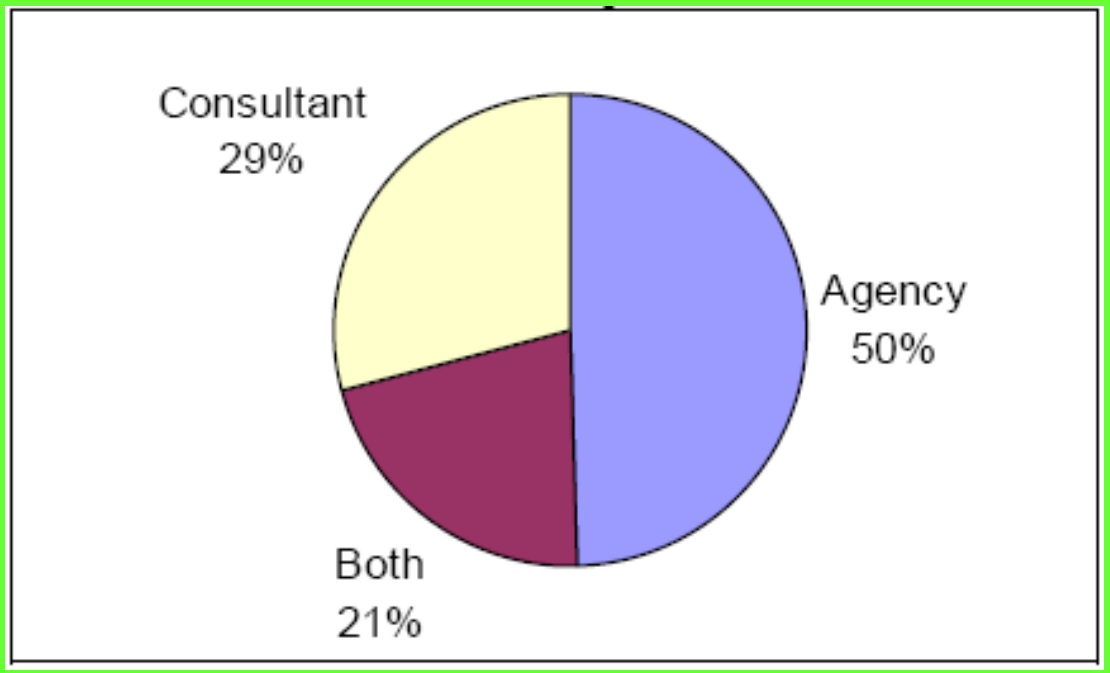
Cedar Falls

Devastation and Elevation

Hazard Mitigation: Integrating Best Practices into Planning

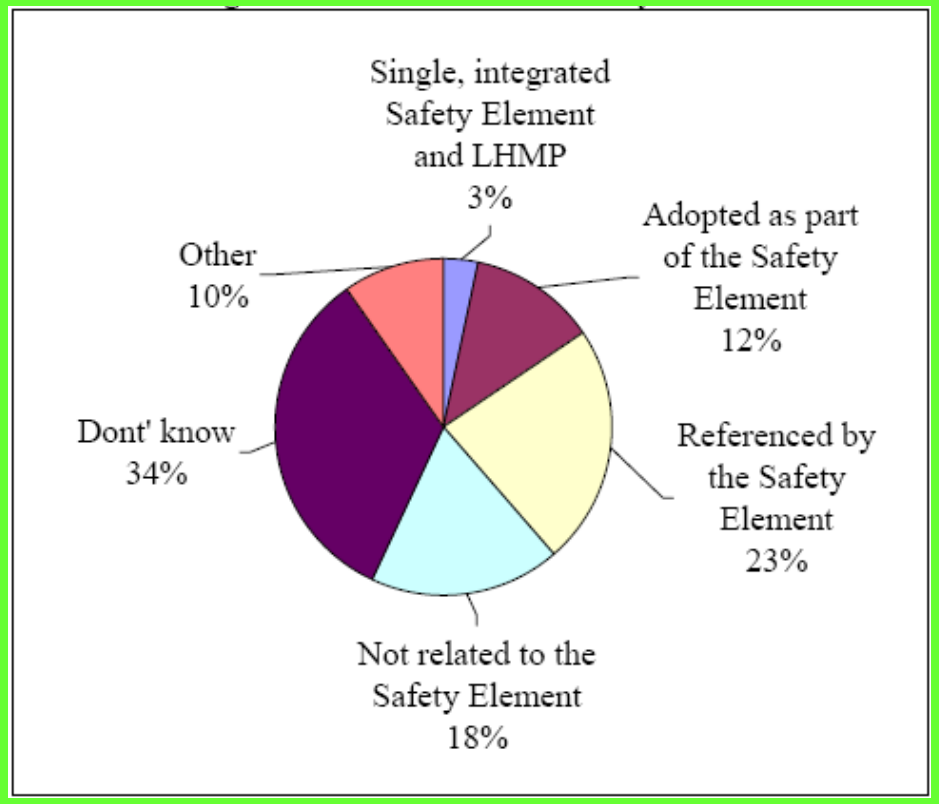
Hazard Mitigation: Integrating Best Practices into Planning

Local Hazard Mitigation Plan Preparers in California

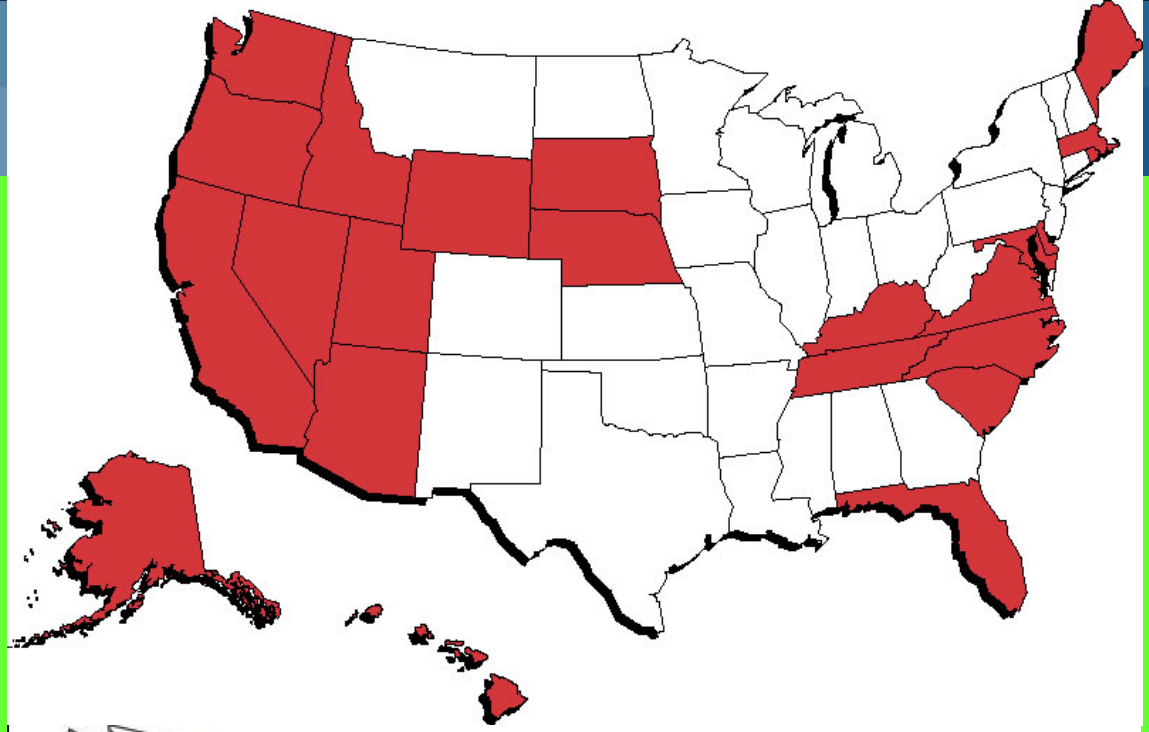


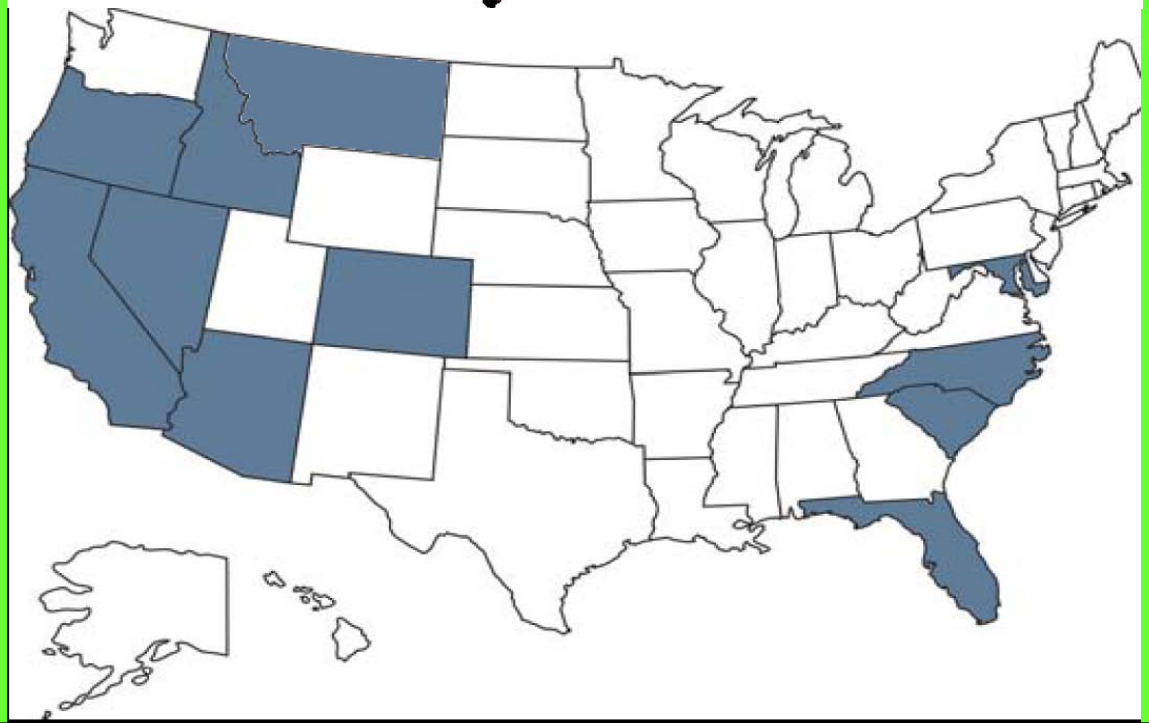
Source: Boswell et al., 2008

Integration of Local Hazard Mitigation Plan with California's Required Safety Element



Source: Boswell et al., 2008





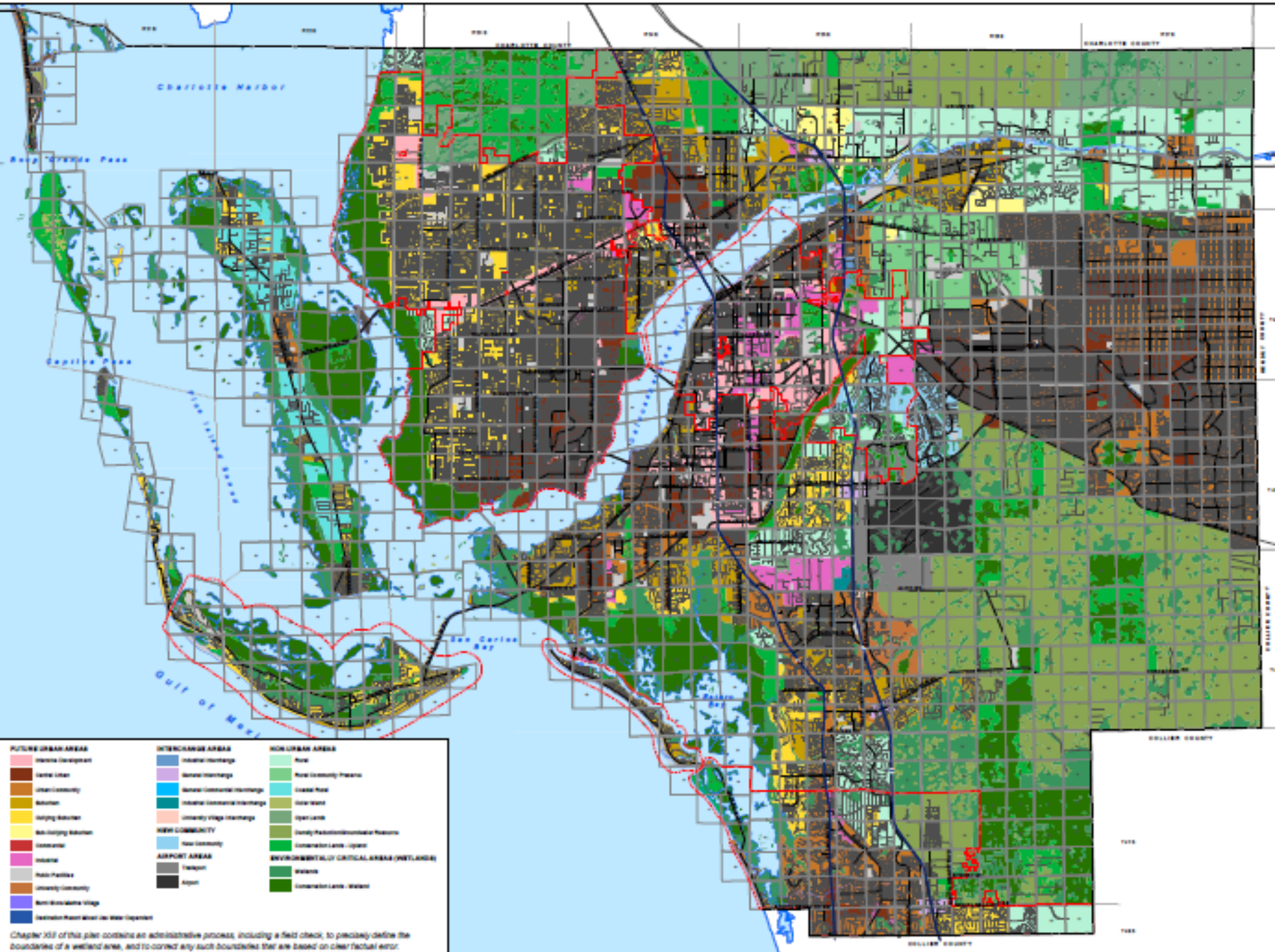
Red: States Mandating Local Comprehensive Plans

Blue: States Requiring Hazards Element in Local Plans*

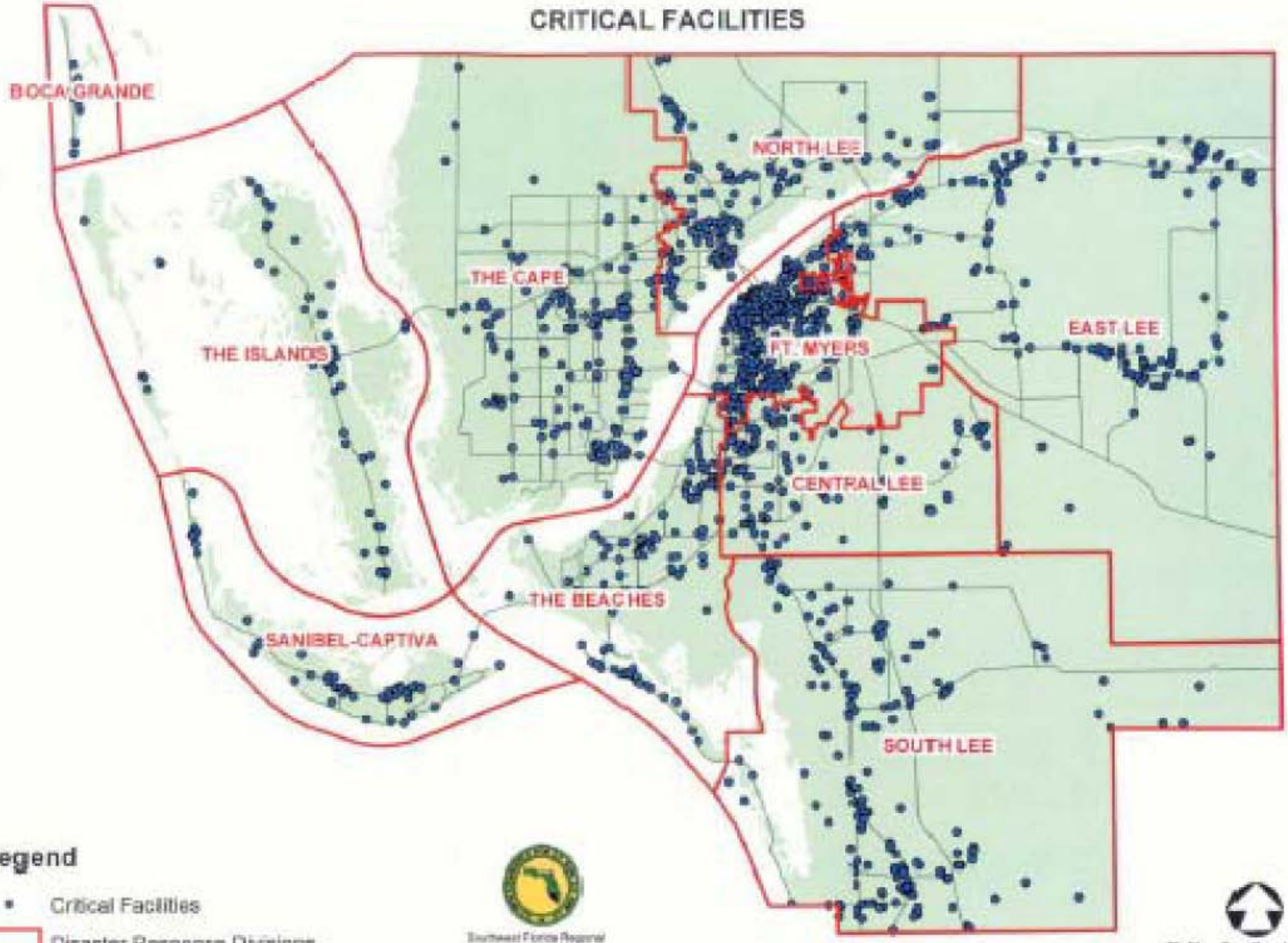
*CO & MT do not require local comprehensive plans.

Integration Case Studies: Large Jurisdictions

- Lee County, FL
  - 2010 pop.: 618,754
  - Up 40.3% from 2000
- Charlotte-Mecklenburg County, NC
  - 2010 pop.: 919,628
  - Up 32% from 2000

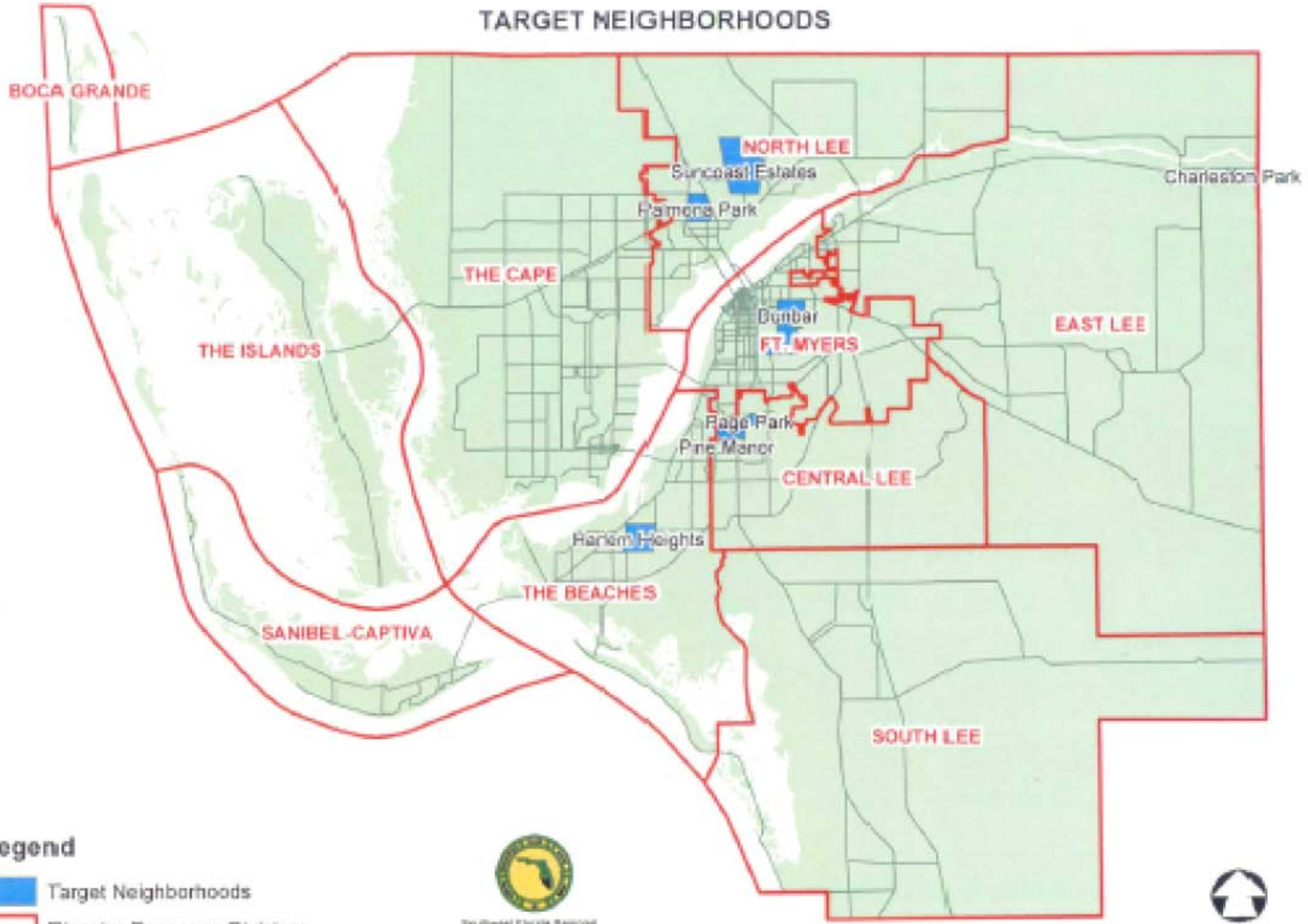

Charlotte Harbor
Gulf of Mexico
CHARLOTTE COUNTY
COLLIER COUNTY
FUTURE URBAN AREAS
INTERCHANGE AREAS
NON URBAN AREAS
NEW COMMUNITY
AIRPORT AREAS
ENVIRONMENTALLY CRITICAL AREAS (WETLANDS)
Chapter XII of this plan contains an administrative process, including a field check, to precisely define the boundaries of a wetland area, and to correct any such boundaries that are based on clear factual error.

CRITICAL FACILITIES



MAP 5

TARGET NEIGHBORHOODS



MAP 4

2007 HAZARD VULNERABILITY ANALYSIS

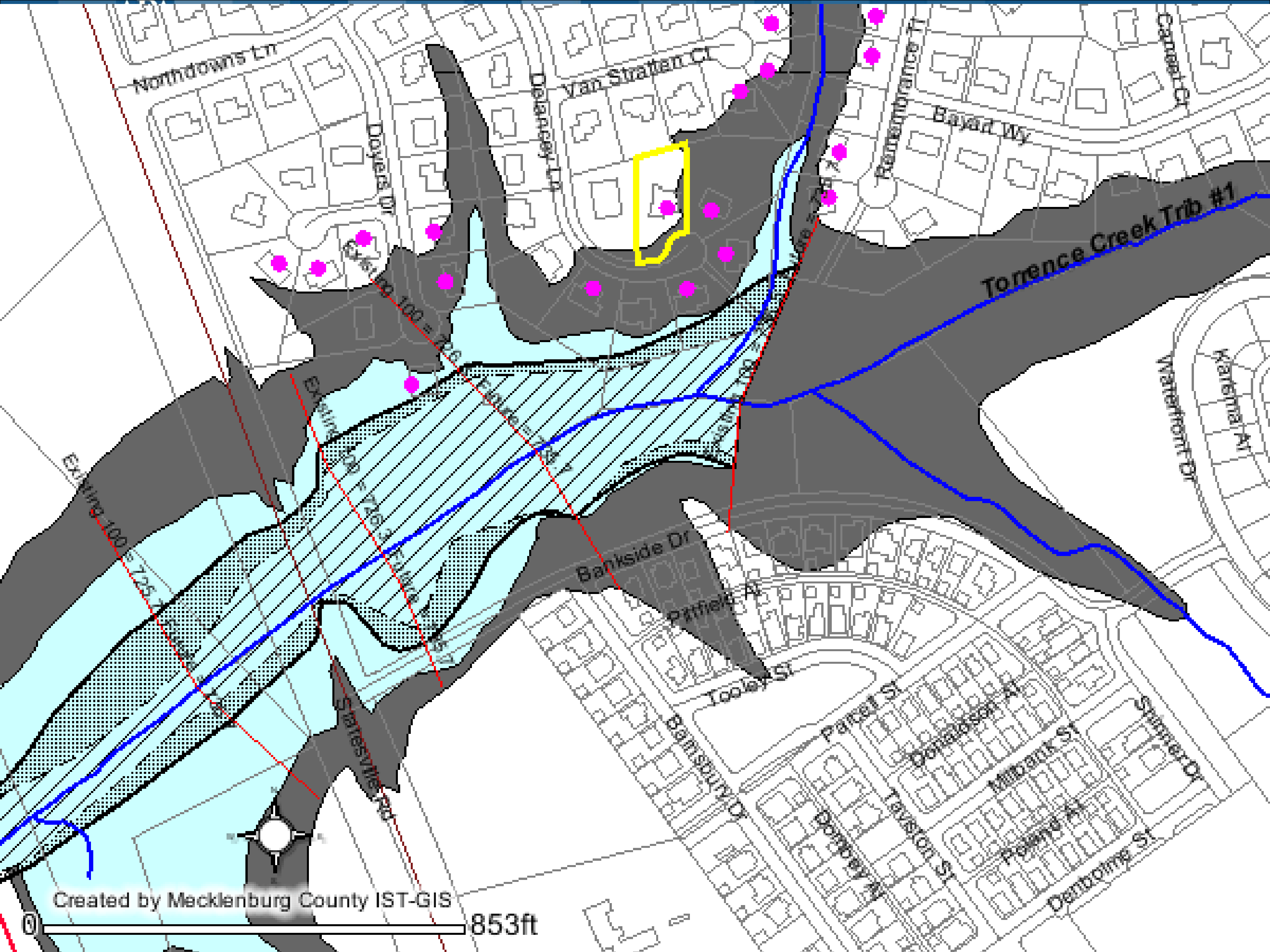
Table 1

Hazard Description	Is Event Significant	Frequency			Maximum Population Affected
		1 year	5 year	10 year	
Agricultural Freeze	Y		X		22,815
Air Transportation Accident	Y		X		11,961
Bridge Failure	Y			>	0
Brush, wildfires, and forest fires	Y	X			
Civil Disturbance	Y				10,695
Commercial Nuclear Power Plant Incidents	N				0
Critical Infrastructure Disruption (Computer Threat, Gas Pipeline Disruption)					
Drought	Y		X		615,741
Exotic Pest and Disease (Mediterranean fruit flies, citrus canker, red rings disease)	Y			X	26,842
Extreme Temperatures					
Flood (Major)	Y		X		13,490
Flood (Minor)	Y	X			1,127
Fixed Facility, Hazardous Material	Y		X		250,036
Oil Spill, Hazardous Material Coastal	Y		X		------
Highway Accident, Hazardous Material	Y	X			217,452
Rail Accident, Hazardous Material	Y			X	228,329
River, Hazardous Material	Y	X			228,901
Hurricane/Tropical Storm	Y		X		615,741
Major Transportation Incidents					------
Mass Immigration	Y			>	13,000
Nuclear Attack	Y				615,741
Pandemic Disease Outbreaks	Y				532,589
Power Failure	Y	X			126,086
Radiological Incident Transportation	Y		X		1,425
Severe Thunderstorms	Y	X			1,414
Sinkholes and Subsidence	N				------
Special Events (Dignitary Visits, Spring Break, etc.)	N	X			------
Tropical Cyclone Events, *Storm Surge*	Y	X			532,589
Tropical Cyclone Events, *Wind*	Y	X			615,741
Terrorism	Y			X	198,624
Thunder Storms and Tornadoes	Y	X			18,096
Urban Fire	Y	X			1,414
Wildfire	Y	X			7,047

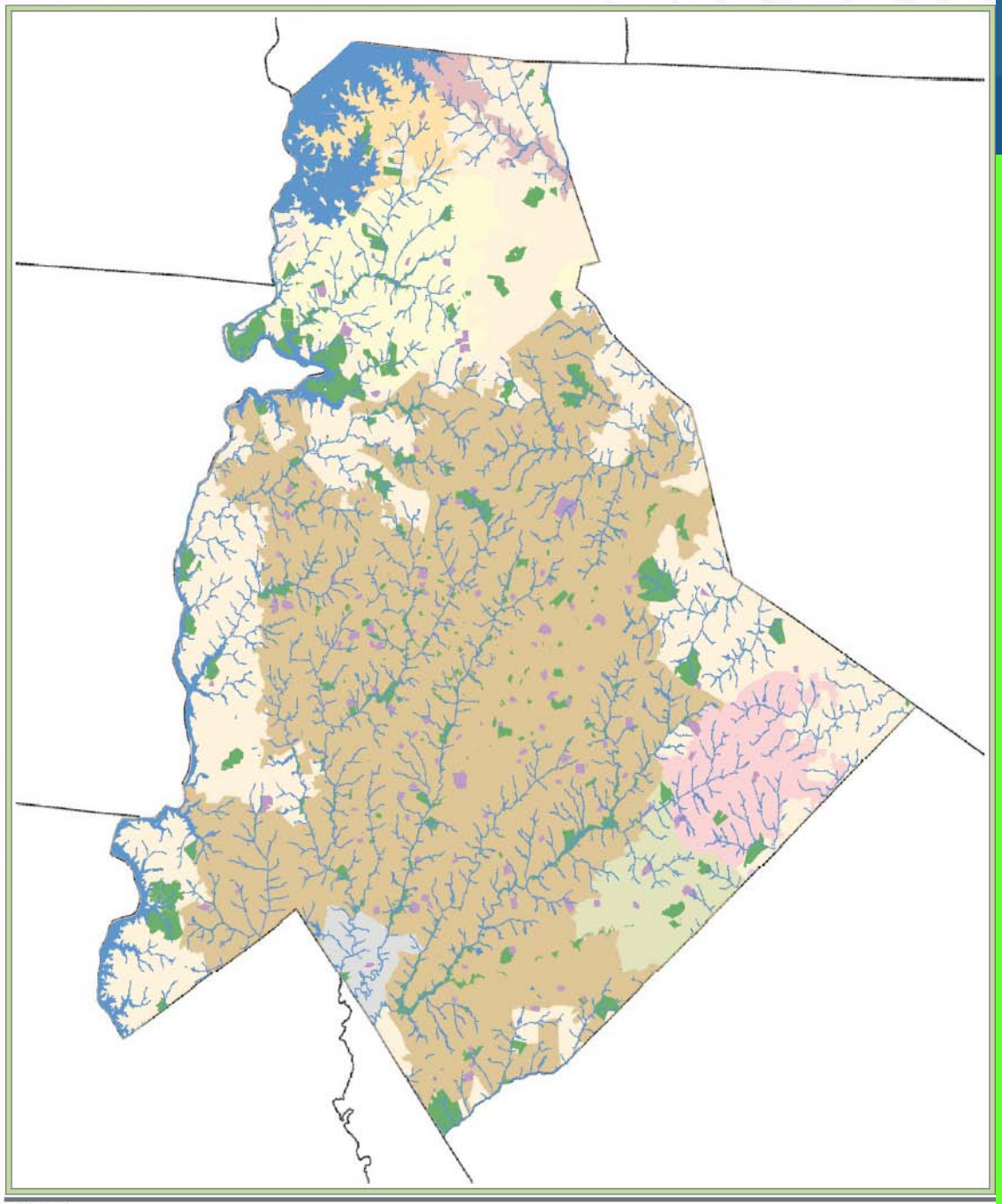
NOTES: > Means occurrence is greater than 10 years.

Lee County Lessons

- Brought countywide mitigation together into single unified plan with full involvement by all parties
- Direct integration of local mitigation strategy and comprehensive plan
  - Goals and strategies complement each other
  - Clear references to relevant programs
- Using capital investments and development regulations offers a model for establishing priorities and implementing initiatives



Northdowns Ln
Van Stratten Ct
Delaney Ln
Doyers Dr
Bayard Wy
Torrence Creek Trib #1
Existing 100 = 726
Existing 100 = 725
Waterfront Dr
Bankside Dr
Pitfield Al
Tooley St
Statesville Rd
Bainsbury Dr
Parcel St
Donaldson Al
Millbank St
Sumner Dr
Tavistock St
Dombey Al
Created by Mecklenburg County IST-GIS
0
853ft



Greenway Master Plan (Priority Map)

Mecklenburg County, North Carolina

Charlotte-Mecklenburg County Lessons Learned

- Quantify and map flood elevations and floodplain boundaries based on “build-out” land-use conditions
- Secure buy-in from stakeholders by involving them early and through transparency of data and methods
- Still a need for better integration of flood mitigation into other local planning
- Bring more planners to the table

Roseville, CA: Real Life Motivation

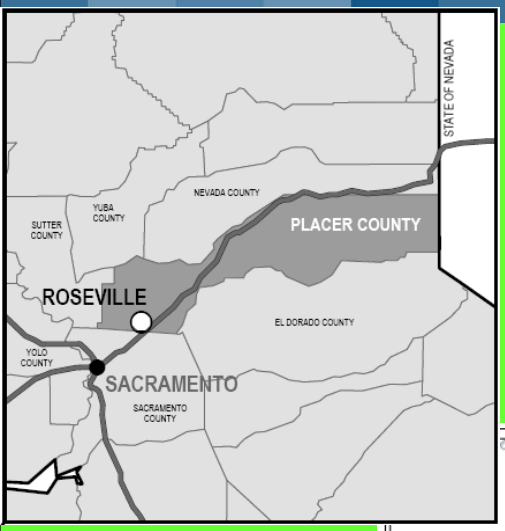
Rail Yard Explosion, 1973

1995 Floods

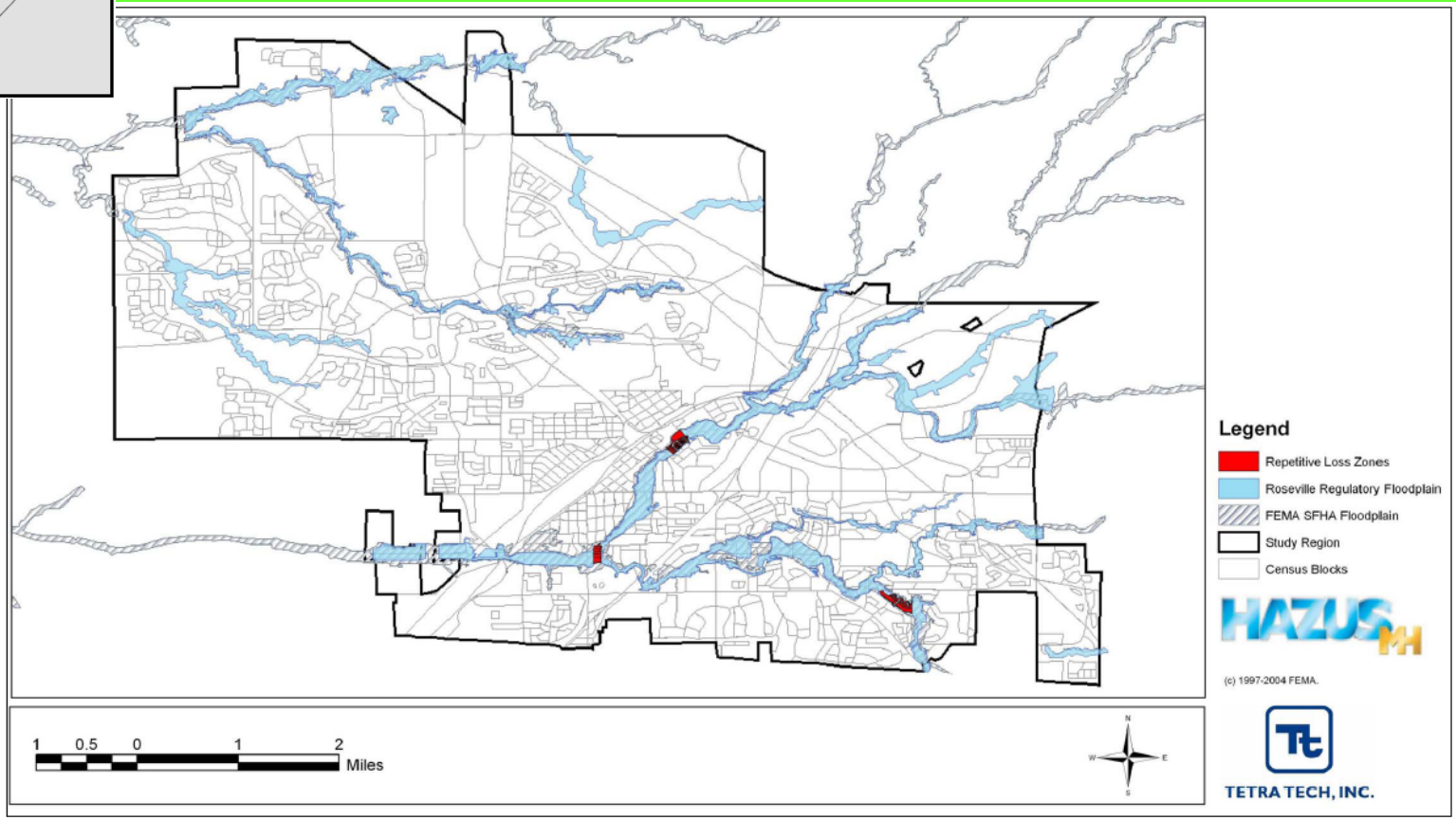
Examples of Flood Improvements from 1986-2001

Year	Project	Approx. Cost
1986	Quadrupled size of culvert at Rocky Ridge Drive on Linda Creek to handle 100-year storm	$250,000
1986	Culvert added at Champion Oaks Drive at Linda Creek and improved channel upstream to increase channel capacity	$100,000
1986	Improved culvert at Union Pacific tracks on Dry Creek	$100,000
1990	Enlarged culvert under Diamond Oaks Road thereby protecting 10 homes that flooded in 1986	$250,000
1992	Replaced Loretto Bridge over Cirby Creek and widened channel between Eich School and Sierra Gardens Drive, bringing all nearby homes out of floodplain	$700,000
1993	Replaced Diamond Oaks culvert, bringing all nearby homes out of floodplain	$500,000
1996	Removed culvert under Union Pacific railroad tracks on Dry Creek downstream of Vernon Street, removing over 150 homes from the floodplain, lowering flood elevations by 5-7 feet	$2 million (City portion $220,000)
1996	Cirby Creek/I-80 project (Tina/Elisa area) included channel excavation and construction of berms and floodwalls. Brought entire Tina/Elisa neighborhood of 40 homes out of floodplain through acquisition. Entire area would have flooded during a 1997 flood if improvements and acquisitions had not occurred.	$3 million (100% City funded)
2001	Elevated structures not completely brought out of the floodplain by flood control project construction. With voluntary homeowner participation, 27 of 44 homes elevated. Most of 27 located in Folsom/Maciel neighborhood along Dry Creek.	$1 million (FEMA funded 75%)
2001	Flood control improvements on Linda Creek in the Champion Oaks/West Colonial Parkway and Sunrise/Oakridge areas replaced culverts with a bridge. Floodwalls and channel excavation brought 233 homes out of floodplain and reduced risk to 44 additional homes. Channel maintained in near natural state, with planting of over 500 oaks.	$16.1 million ($8.7 million FEMA, $7.4 million City funds)

Source: City of Roseville Flood Facts



Roseville Drainage Basins

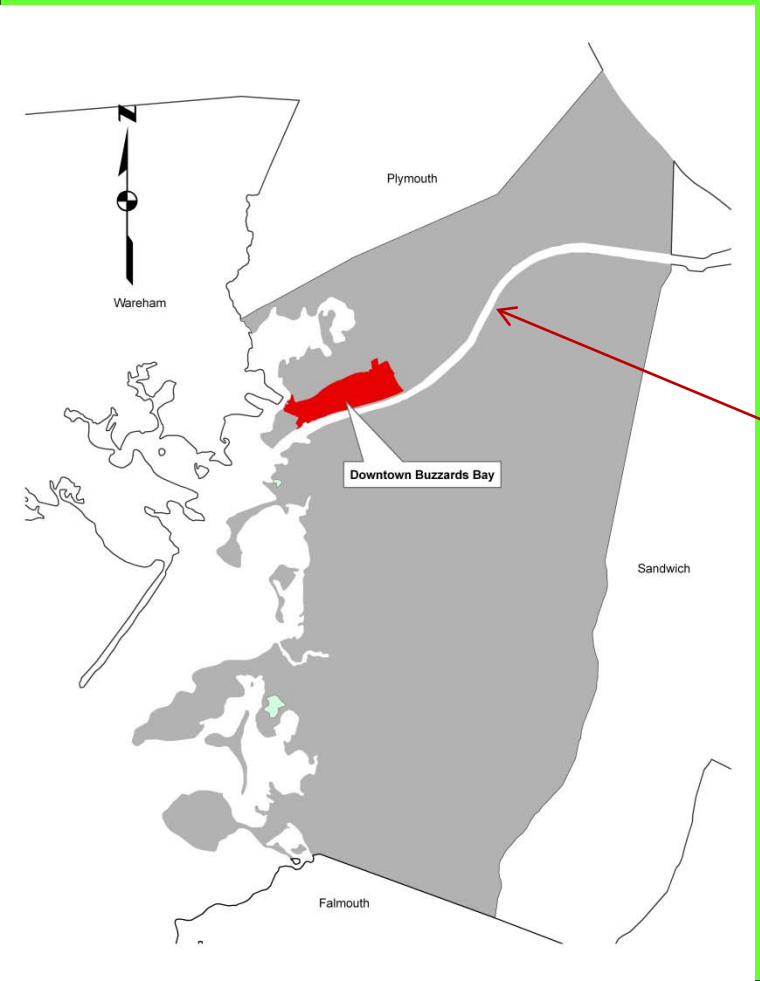


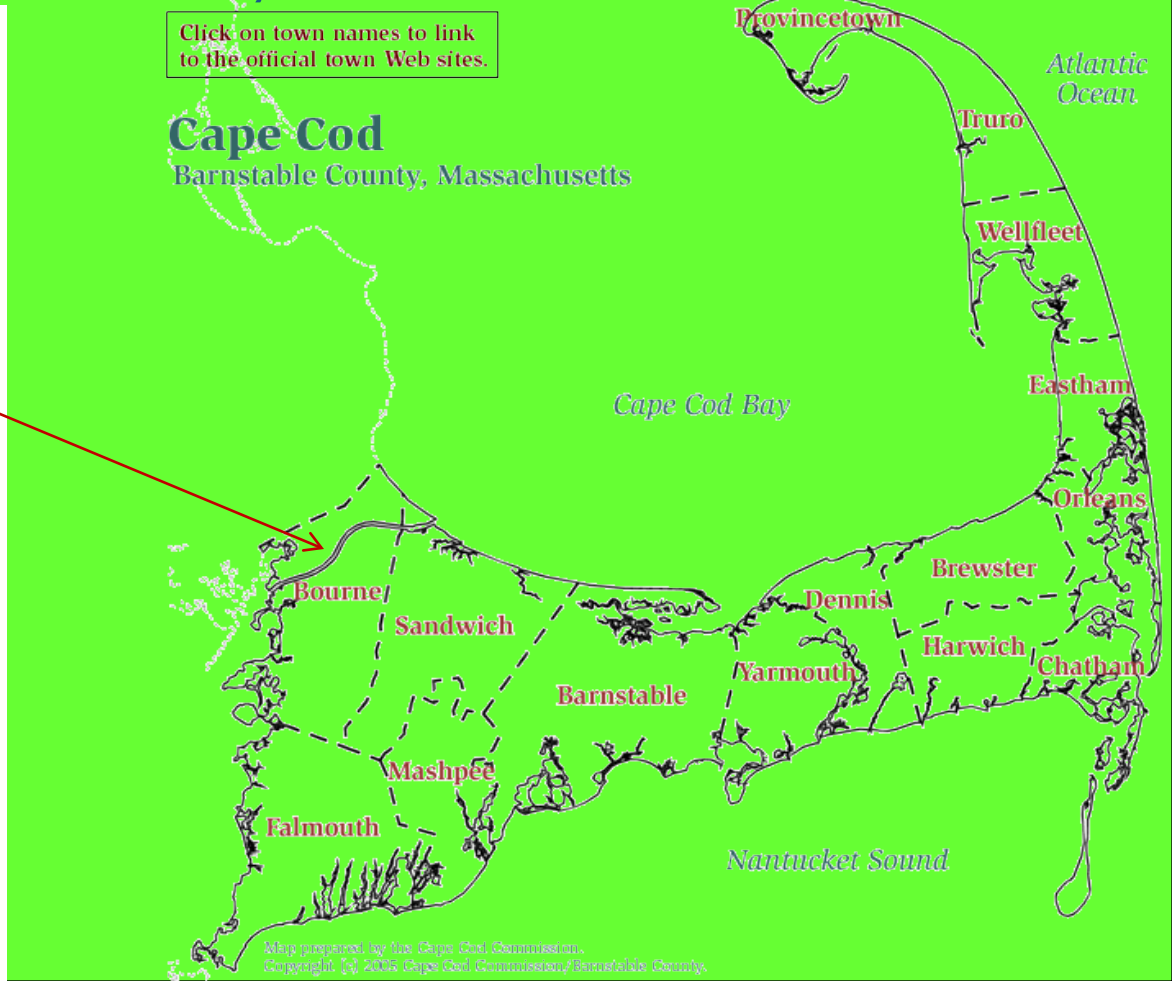
Roseville Lessons Learned

- Public safety through mitigation can become an economic development marketing tool
- Protecting community assets from loss is a path to sustainability
- Using mitigation for open space and to reduce excess water consumption helps build a Green Community
- State and federal requirements can be used with unique local needs to build local capacity for resilience
- Strong culture of preparedness reinforces objectives of hazard mitigation, economic development, and conservation

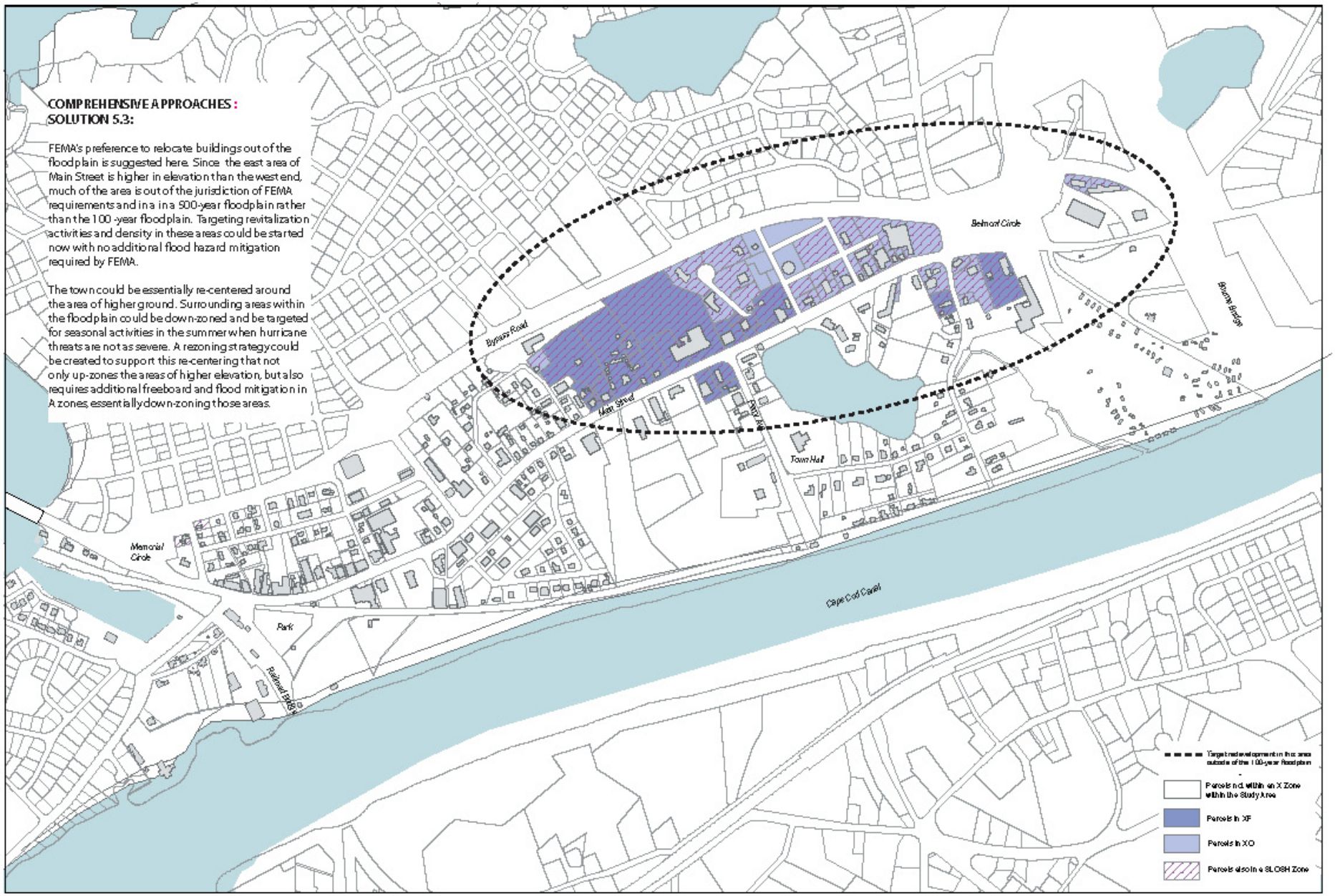
Integration Case Studies: Rural Jurisdictions and Small Towns

Bourne, MA






FLOOD ZONE TYPE
Parcels with Flood Zone Information Not Included
VE17
AE16
AE15
AE14
XF
XO
Extent of Flood Data from FIRM Maps Digitized for this Study
Belmont Circle
Main Street
Town Hall
Memorial Circle
Park
Cape Cod Canal


COMPREHENSIVE APPROACHES:
SOLUTION 5.3:
FEMA's preference to relocate buildings out of the floodplain is suggested here. Since the east area of Main Street is higher in elevation than the west end, much of the area is out of the jurisdiction of FEMA requirements and in a in a 500-year floodplain rather than the 100-year floodplain. Targeting revitalization activities and density in these areas could be started now with no additional flood hazard mitigation required by FEMA.
The town could be essentially re-centered around the area of higher ground. Surrounding areas within the floodplain could be down-zoned and be targeted for seasonal activities in the summer when hurricane threats are not as severe. A rezoning strategy could be created to support this re-centering that not only up-zones the areas of higher elevation, but also requires additional freeboard and flood mitigation in A zones, essentially down-zoning those areas.
Belmont Circle
Bypass Road
Main Street
Perry Ave
Town Hall
Memorial Circle
Park
Railroad R/R
Cape Cod Canal
Target redevelopment in the area outside of the 100-year floodplain
Parcels not within an X Zone within the study area
Parcels in XF
Parcels in XO
Parcels also in a SLOSH Zone

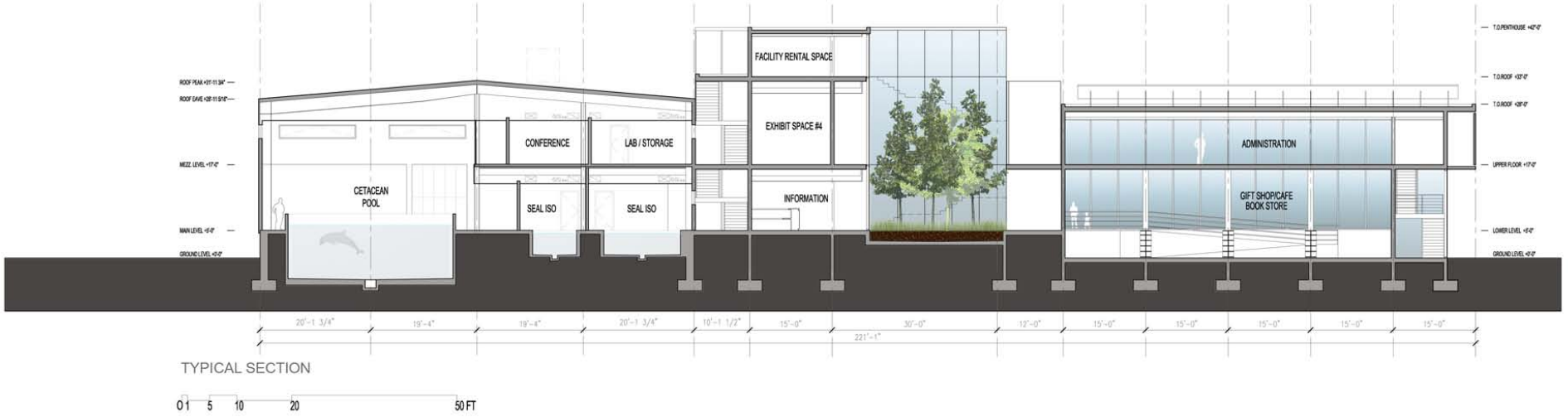
Bourne Hazard Identification Matrix

Natural Hazard	Likelihood of Occurrence 0 = unlikely 1 = Possible 2 = Likely 3 = Highly likely	Location 1 = Small area 2 = Medium area 3 = Large area	Impacts 1 = Limited 2 = Significant 3 = Critical 4 = Catastrophic	Hazard Index
Flood	3	3	3	9
Wind Related:				
• Hurricane	3	3	3	9
• Coastal Storms	3	2	3	8
• Winter Storms	2	3	3	8
Fire Related:				
• Drought	1	3	2	6
• Wildfires	2	3	2	7
• Urban Fires	1	1	1	3
• Shoreline Erosion	3	3	3	9
Shoreline Erosion	3	3	3	9
Geologic Hazards				
• Associated Landslides of Coastal Banks	2	2	2	6
• Earthquakes	0	3	1	4
Tornadoes	0	1	1	2

Bazzards Bay Antique Center
LEFT LANE MUST TURN LEFT


BUZZARDS BAY
VISIONING WORKSHOP
July 2007
Stantec


The National Marine
Life Center Inc.



TYPICAL SECTION

0 1 5 10 20 50 FT

Visualization of future Marine Life Center

Bourne Lessons Learned

- Be aware of current situation and what can be done
- Provide that information generously to the public
- Creative, sound, cost-effective strategies exist for developing within strict flood mitigation requirements; financial incentives can further improve this outlook
- Hazard mitigation is an economic development issue; why reinvest where hazards can threaten your investment?
- Economic development interests can be enlisted to help generate buy-in for hazard mitigation

Findings: What Works

- Complementary Goals and Objectives in the Local Hazard Mitigation Plan and Comprehensive Plan
- Implementing Hazard Mitigation through Government Expenditures and Development Regulations
- Documenting Existing and Predicted Future Conditions and Raising Awareness of What Can Be Done about Them
- Mutual Reinforcement Between Hazard Mitigation and Other Planning Goals
- Sustaining Leadership for Hazard Mitigation
- Strong Culture of Preparedness and Mitigation
- Using External Drivers As Leverage While Focusing on Community Needs
- Proactive Outreach and Stakeholder Involvement in Planning

Findings: What Does Not Work?

- Procrastination
- Failure to Involve Planners in Local Hazards Planning
- Failure to Engage Public Participation or to Communicate about Hazards
- Investment in Redevelopment without Accounting for Hazards
- Failure to Use Other Plans to Address Hazards

Big Thoughts in Conclusion

THE ROAD AHEAD:

- ✓ Learn from Disasters
- ✓ Start Change Now
- ✓ Strengthen Integration of Hazards with Other Planning Activities
- ✓ Think Linkages

Contact Information

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Hazards Planning Research Center:
http://www.planning.org/nationalcenters/hazards/index.htm

Hazard Mitigation Project:
http://www.planning.org/research/hazards/index.htm

Planning for Post-Disaster Recovery (new project):
http://www.planning.org/research/postdisaster/