Hazard Mitigation Techniques

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Cooperative Extension in Coastal Processes

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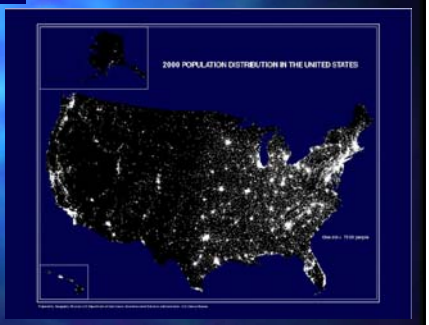
Coastal Sustainability ?

Close to 4 billion people - two-thirds of humanity - live within 400 km of a seacoast.

Roughly 3.1 billion people - half of the world's population - lives within 200 km of a coast, occupying only 10 per cent of the earth's land surface.

This population is growing at 5 to 6 % per year



Coastal Sustainability ?

- With increasing population pressure within the coastal zone it is imperative that we properly manage our coastal resources to protect the environment, people and property against:
  - Natural Hazards
  - Environmental Degradation
  - Economic Devaluation

Sustainability through Mitigation

- Through informed decision making, planning and management the potential impacts posed by natural and man-made hazards can be minimized through mitigation that recognizes:
  - The underlying natural hazards and the dangers they pose; and
  - The reduction in risk versus the economic and social cost of change.

The Hazard Mitigation Process

1. Community Profile Development
   - Current Land Use
   - Population Demographics
   - Value of the Built Environment
   - Identification of Vulnerable and Critical Facilities
2. Hazard Identification
   - Characteristics of Potential Hazards
   - Recent Event Analysis (Impact and Costs)

The Hazard Mitigation Process

3. Risk Assessment
   - Probability of Occurrence
   - Probable Impacts
4. Vulnerability Assessment
   - Estimation of Population and Value at Risk
   - Assessment of Relative Risk to each Hazard
   - Weighting of Risk relative to:
     - Area Impacted
     - Health and Safety Consequences
     - Economic Impacts
     - Property Impacts
     - Environmental Impacts

The Hazard Mitigation Process

5. Development of an All-Hazard Mitigation Strategy
   - Identification of Sound Mitigation Projects
     - Positive Cost/Benefit Ratio
   - Sustained Planning and Maintenance Effort
   - Private and Public Participation/Efforts

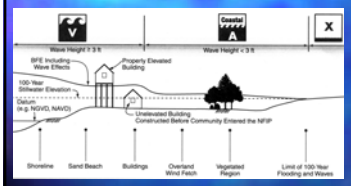
Coastal Hazard Mitigation

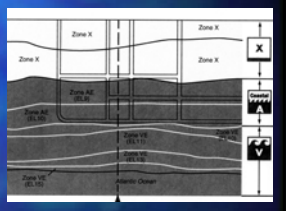
- Hazard reduction can be achieved along many different scales
  - Large-scale National Projects that are tax funded
  - Medium-scale State or Providence initiated
  - Local Government sponsored
  - Grassroots/Property Owner initiated
- Scale of Mitigation depends on the level of residual risk that is acceptable in contrast to the value of the infrastructure /resource being protected.

Hazard Mitigation Techniques

- Regulation
- Removal of Vulnerability (“Buyout”)
- Structural Protection
- Soft Coastal Protection
- Improved Building Design
- Natural Resource Restoration and Management (“The New Orleans Example”)
- Research, Outreach and Public Education

Federal Regulation

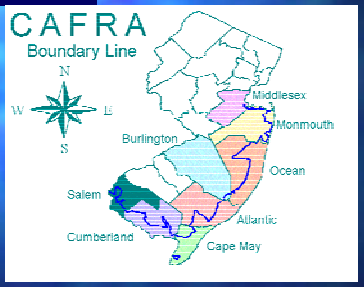




Improved Federal Flood Hazard Mapping based on better data and modeling

Medium-scale State or Provincial Mitigation

State Regulation



Improved Coastal Zone Regulations to limit density, type and location of development

Participation in the NFIP CRS

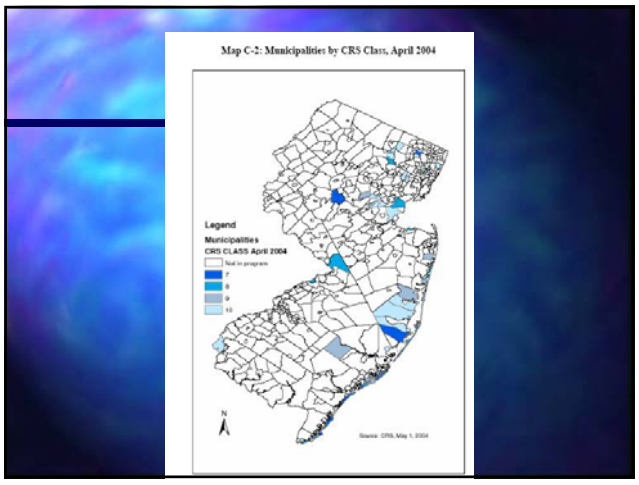
Table C-2: Community Rating System Classifications

Credit points earned, classification awarded, and premium reduction: given for communities in the National Flood Insurance Program Community Rating System.

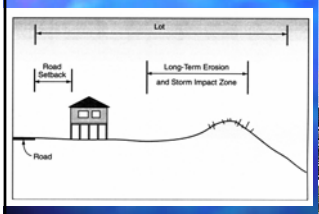
		Premium Reduction	
Credit Points	Class	SFHA*	Non-SFHA**
4,500+	1	45%	5%
4,000 – 4,499	2	40%	5%
3,500 – 3,999	3	35%	5%
3,000 – 3,499	4	30%	5%
2,500 – 2,999	5	25%	5%
2,000 – 2,499	6	20%	5%
1,500 – 1,999	7	15%	5%
1,000 – 1,499	8	10%	5%
500 – 999	9	5%	5%
0 – 499	10	0	0

*Special Flood Hazard Area

**Preferred Risk Policies are available only in B, C, and X Zones for properties that are shown to have a minimal risk of flood damage. The Preferred Risk Policy does not receive premium rate credits under the CRS because it already has a lower premium than other policies. Although they are in SFHAs, Zones AR and A99 are limited to a 5% discount. Premium reductions are subject to change.



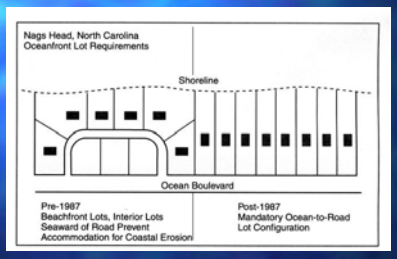
Restoration of Natural Coastal Features and Building Set-back



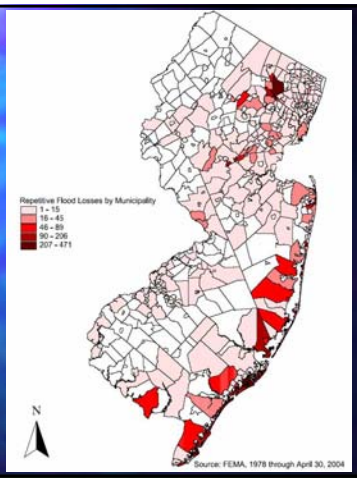
Renourishment of eroded shorelines and restoration of natural features in order to provide a buffer from Long-term erosion hazards. Future development should be set-back behind the 30-yr long-term erosion Limit.

Medium or Local-scale Mitigation achieved through regulation, ordinances or codes.

Allow for Building Migration?

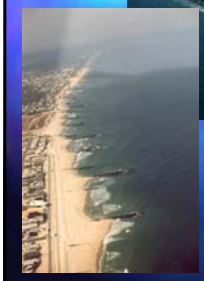


Reduce Vulnerability



Reduce Vulnerability

Structural Coastal Protection



Hard coastal structures have been utilized to stabilize or limit the recession of an eroding shoreline. Generally a Large- or Medium-scale Mitigation Technique.

Without the addition of sand, this mitigation practice eventually exacerbates the erosion problem leading to a loss of coastal resources and a devaluation of the coastal zone.

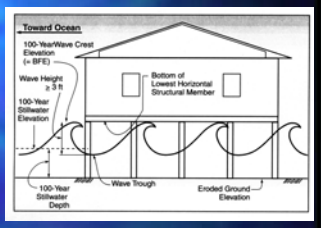
Flood Control Structures

Soft Coastal Protection

Beach Nourishment recreates lost coastal resources but does not stop the Underlying erosion. The restored resource must be maintained through periodic Renourishment and local coastal management.

Genrally Beach Nourishment is a Large-scale mitigation technique due to the high cost

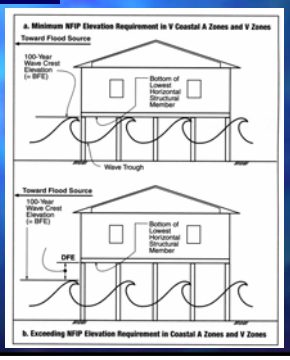
Improved Building Design



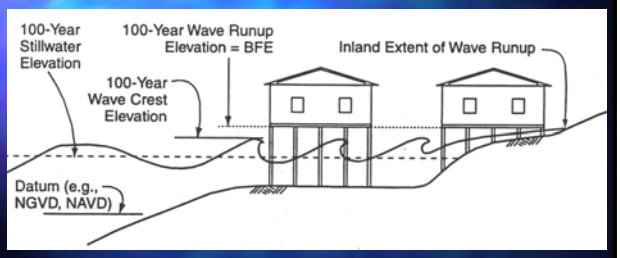
Understanding the evolution of Multiple Coastal Hazard Levels over the life of coastal structures allows for improved building designs. Elevating structures a few feet above the maximum potential water level provides a buffer against future sea level rise and long-term shoreline recession. Stronger connections at roof and wall plates and storm shutters hardens the building envelop against wind damage.

Small-scale Homeowner Mitigation

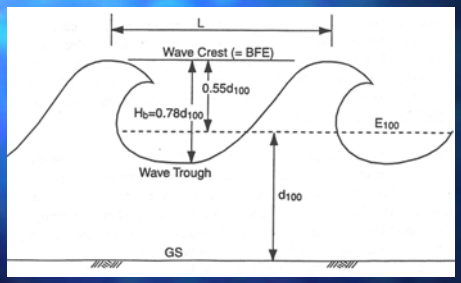
In Flood Prone Areas: Elevate!



100-Year Storm Surge



Added water elevation due to waves

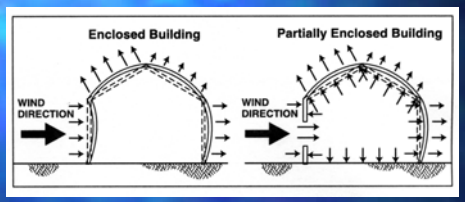


Elevate everything!

The state-of the art Elizabethtown Canal Road Water Treatment Plant cost approximately $100 million.

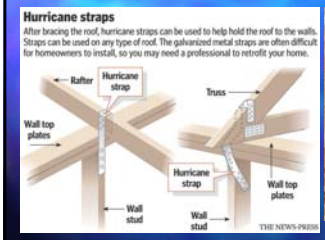
Including Important Access Roads

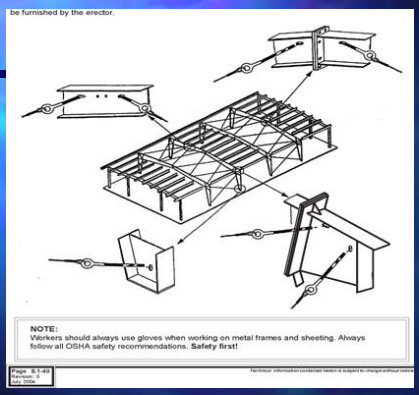
Wind Damage Reduction



Secure the building envelope

Establish strong connections





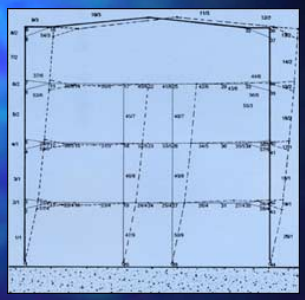
Reduce the amount of openings

Anchor light structures

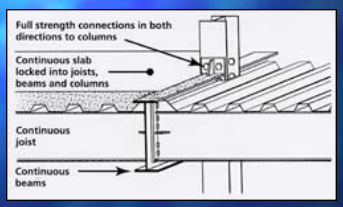
Install Shutters to reduce impact damage and breaching

Earthquake Conundrum

Elevation adds to sway of structure during seismic events



Shear Resistant Connections



Natural Resource Restoration

Grassroots level restoration of lost coastal resources through natural methods and plantings. Provides natural buffer and increased value of coastal zone for Relatively little cost. Note new home built seaward of the bulkhead line in violation of set-back ordinance.

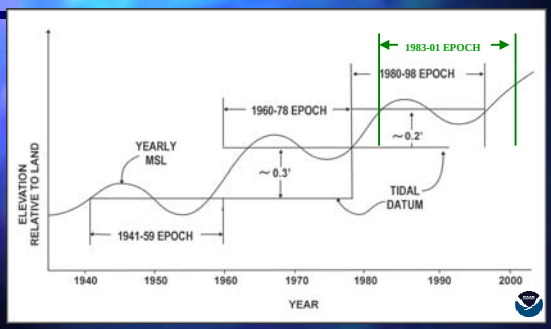
Effective Management of Natural Areas

Number of Incidents per Year by County*

County	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	Totals	10 Year Average	Rank
Atlantic	219	171	226	126	214	224	206	155	233	250	163	2186	219	2
Bergen	15	9	7	1	7	8	8	6	13	4	5	81	8	17
Burlington	141	141	154	99	121	133	140	88	128	109	64	1318	132	4
Camden	57	56	110	55	138	126	145	124	143	103	47	1132	113	6
Cape May	48	72	129	59	86	71	84	50	92	80	40	811	81	9
Cumberland	151	152	191	93	151	206	173	100	140	102	58	1517	151	3
Gloucester	18	50	77	34	67	53	72	36	73	78	23	581	58	11
Hunterdon	55	32	72	21	37	28	69	44	66	42	26	491	49	15
Mercer	5	3	2				5		4	26	8	48	5	18
Middlesex	65	51	70	18	54	50	87	62	106	106	41	710	71	10
Monmouth	63	51	48	30	30	34	50	33	75	54	42	512	51	13
Morris	146	84	137	62	113	99	139	58	65	87	63	1053	105	7
Ocean	355	313	452	196	347	304	412	261	374	287	227	3528	353	1
Passaic	51	51	66	17	37	50	71	29	61	39	21	493	49	14
Salem	24	32	78	22	36	47	24	10	38	37	13	361	36	16
Somerset	79	97	57	6	50	17	65	15	50	86	41	561	56	12
Sussex	52	67	87	38	137	109	178	85	162	129	102	1146	114	5
Warren	54	60	64	33	56	94	129	71	90	144	55	854	85	8
Total	1593	1522	2021	910	1681	1653	2055	1237	1912	1762	1039	17385	1738	

*The number of incidents includes only those wildfires to which the NJ Forest Fire Service responded to in its designated response area. Numbers are rounded for clarity.

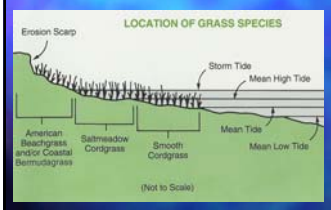
IDEALIZED CHANGE OF Sea Level
What does this mean to mitigation?



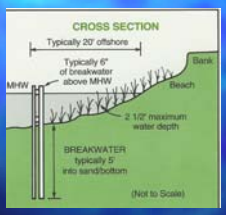
Seaside Park (Bayside) Tidal Datum

Highest Observed (12/11/1992)	= 6.62 feet
MHHW	= 0.46 feet
MHW	= 0.39 feet
MTL	= 0.25 feet
NAVD88	= 0.24 feet
NGVD29	= 0.16 feet
MLW	= 0.01 feet
MLLW	= 0.00 feet
Lowest Observed (01/22/1985)	= -2.23 feet

Can reconstruction of Natural Environment Reduce Future Hazards?



...Can Include Natural and Traditional Structure Combinations ?



Relocation of Utilities?

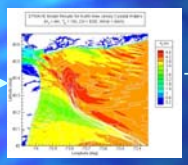
Out of flood prone areas

Backup Utility Installation Locally

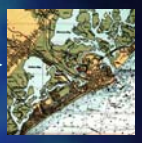
But Elevated!

Coastal Research, Outreach and Education

Sustained Observations



Improved Modeling & Analysis

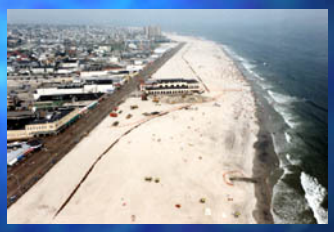


Risk Assessment

Public Education

Public Outreach

Are We Prepared?



Not Completely

- Need to Improve:
  - Coastal Building Standards
  - Evacuation Routes
  - Back Bay Flood Protection
  - Sediment Management