Catastrophic Risk in New Jersey: Past, Present and Future

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Allianz Risk Transfer
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Natural Catastrophes
Impacts

- Insured losses from the 2009-2010 Northern Hemisphere winter were $2.6 billion, highest since 2003 (Munich Re)
- Insured losses from the 2005 hurricane season over $100 billion (Swiss Re)
- Most expensive tornado outbreak in US history in late April 2011: Insured loss estimates range between $3.5 - $6 billion
- 167 natural catastrophic events occurred in 2010 – *RECORD* (Swiss Re)

Weather and its Economic Impact
United States

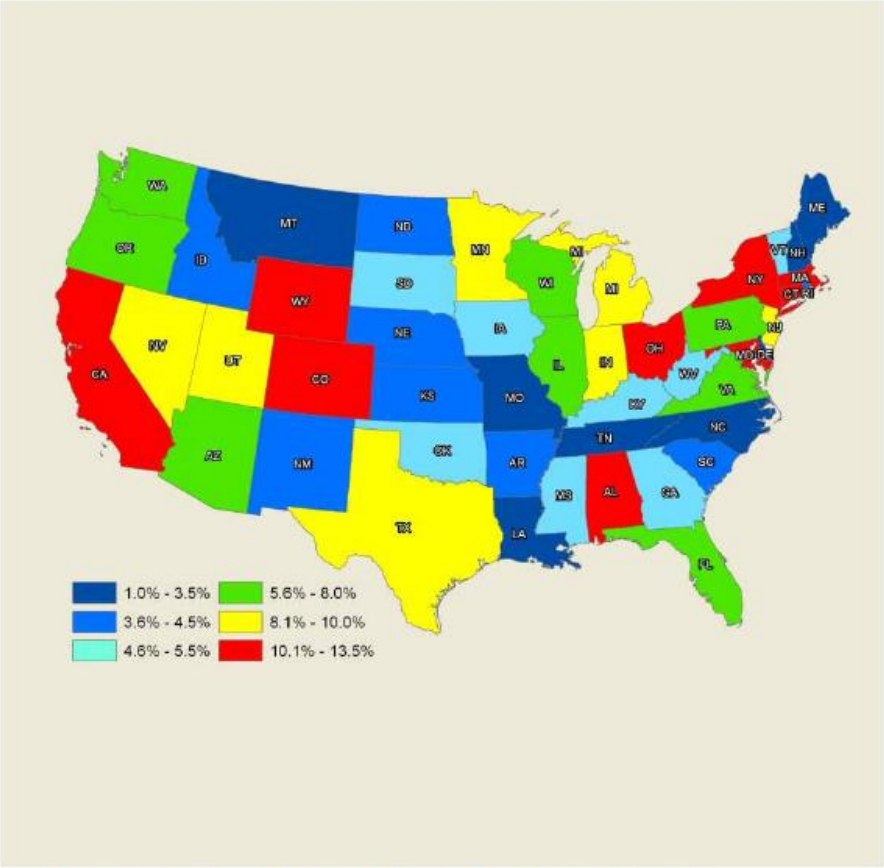
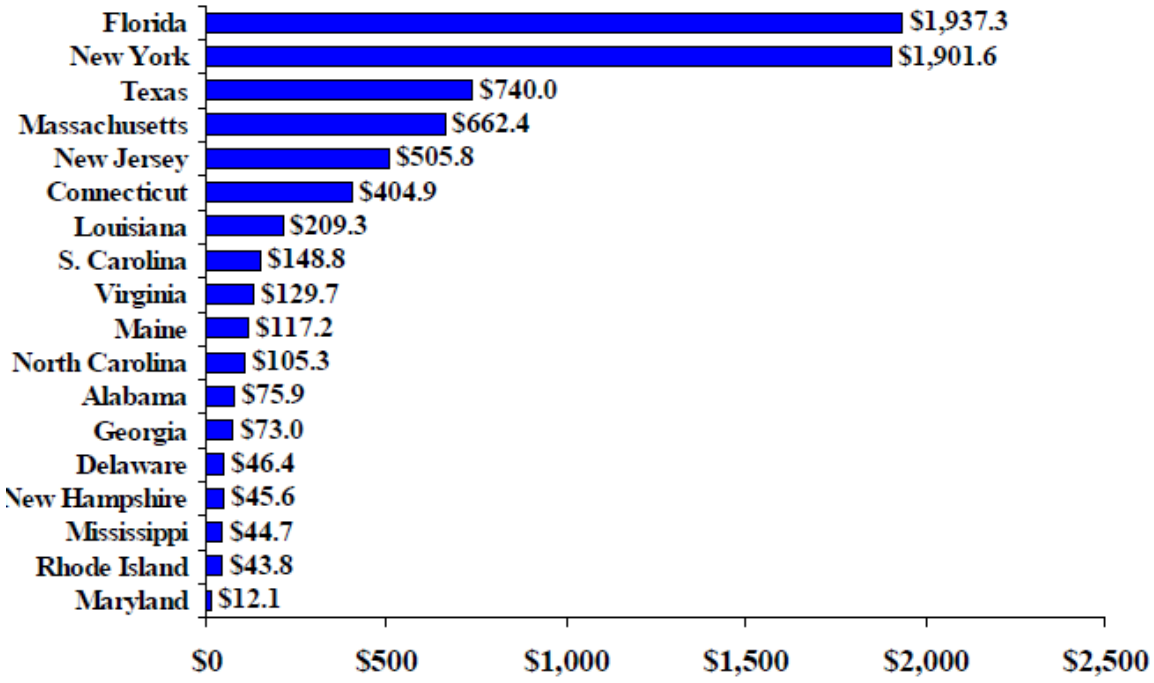


Fig. 5. State sensitivity to weather variability as a percentage of total GSP.

Source: Lazo et al (2011)

- All 11 non-governmental sectors of US economy are sensitive to weather variability
- US economic output varies as much as 3.4% of the 2008 gross domestic product (GDP; $485 billion) as a direct result of weather variability
- NOAA estimates $2.65 trillion, or 25% of the US GDP, is impacted by weather
- Economic sensitivity of New Jersey is 8-10% of gross state product (GSP) due to weather variability

Exposure in New Jersey



Source: III/AIR

- Fifth highest coastal exposure among hurricane exposed states
- AIR estimates of $505.8 billion of coastal exposure in 2007
- Inflating to present day, coastal exposure closer to $600 billion

Loss Drivers in New Jersey

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- Annual aggregate basis – Severe thunderstorms (tornado/hail/straight-line winds) contribute the most to insured losses
- Event basis – Winterstorms and hurricanes result in large insured losses; severe thunderstorm losses are negligible

Significant Northeast Hurricane Losses 1900-present

Storm Name	Year	Present Day Loss
Vagabond Hurricane	1903	195,000,000
Long Island Express	1938	39,200,000,000
Great Atlantic Hurricane	1944	13,200,000,000
Carol	1954	16,100,000,000
Donna	1960	29,600,000,000
Agnes	1972	17,500,000,000
Belle	1976	500,000,000
Gloria	1985	2,400,000,000
Bob	1991	3,000,000,000
Floyd	1999	6,700,000,000

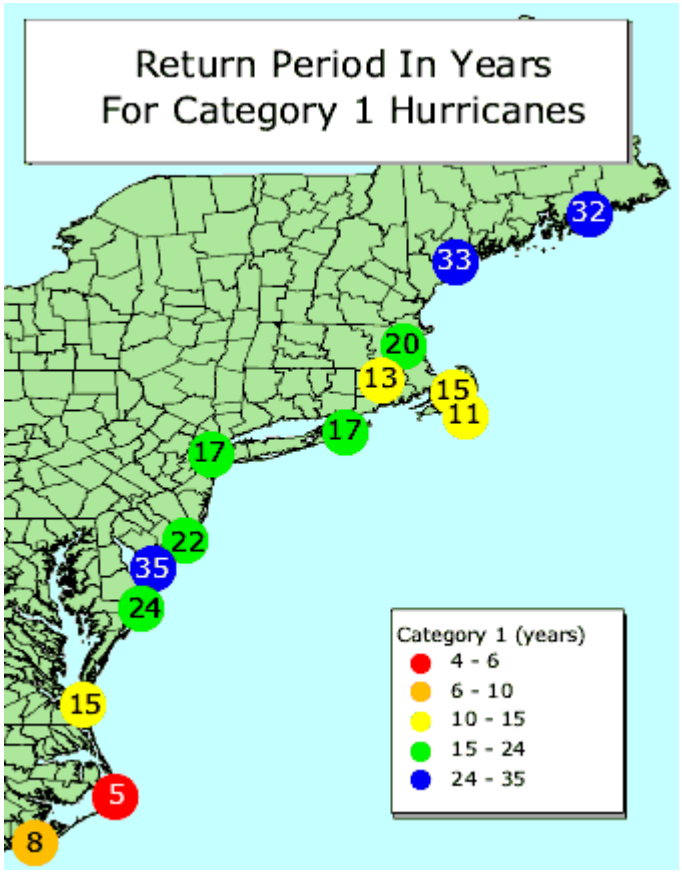
Source: Pielke et al. (2005)

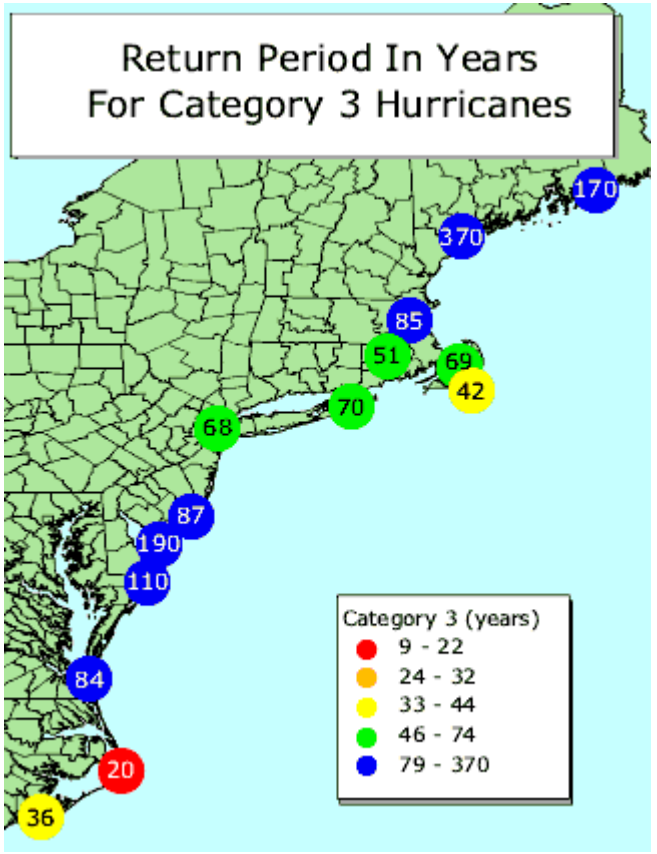
Ash Wednesday Nor'easter of 1962

Picture: USGS

- New inlets cut on LBI
- Avalon lost 6 blocks
- 45,000 homes lost or destroyed
- Access on LBI prevented for weeks

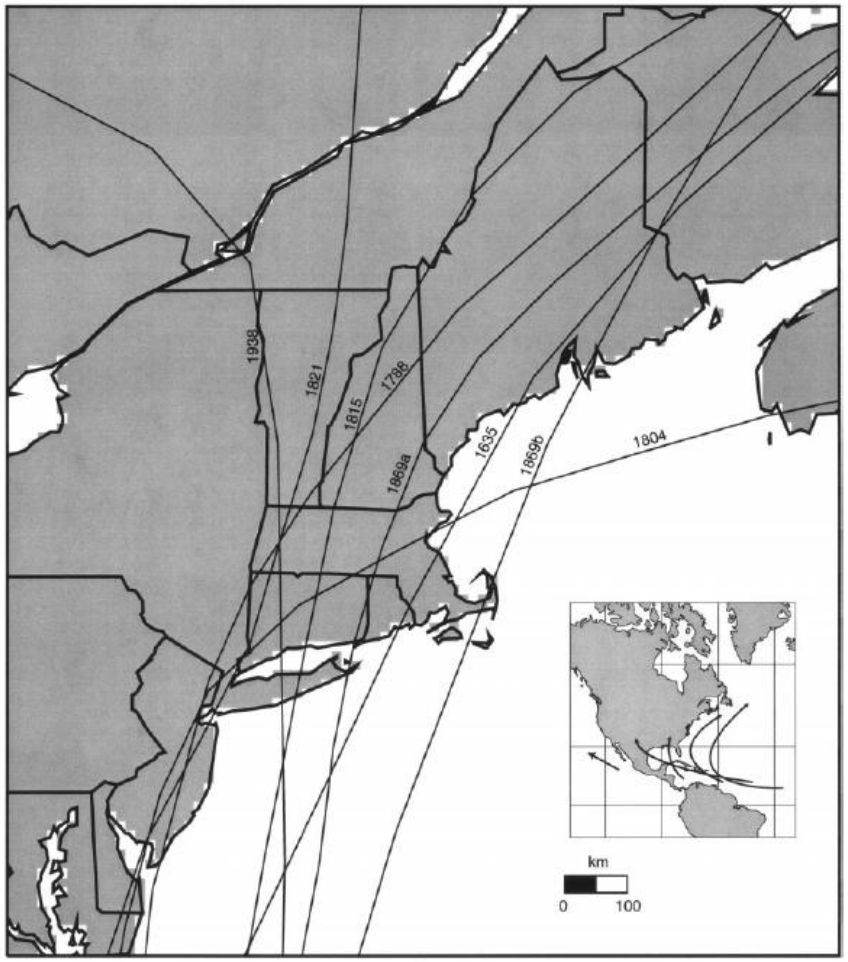
Hurricane Return Periods





Source: NHC

Pre-1900 Hurricanes

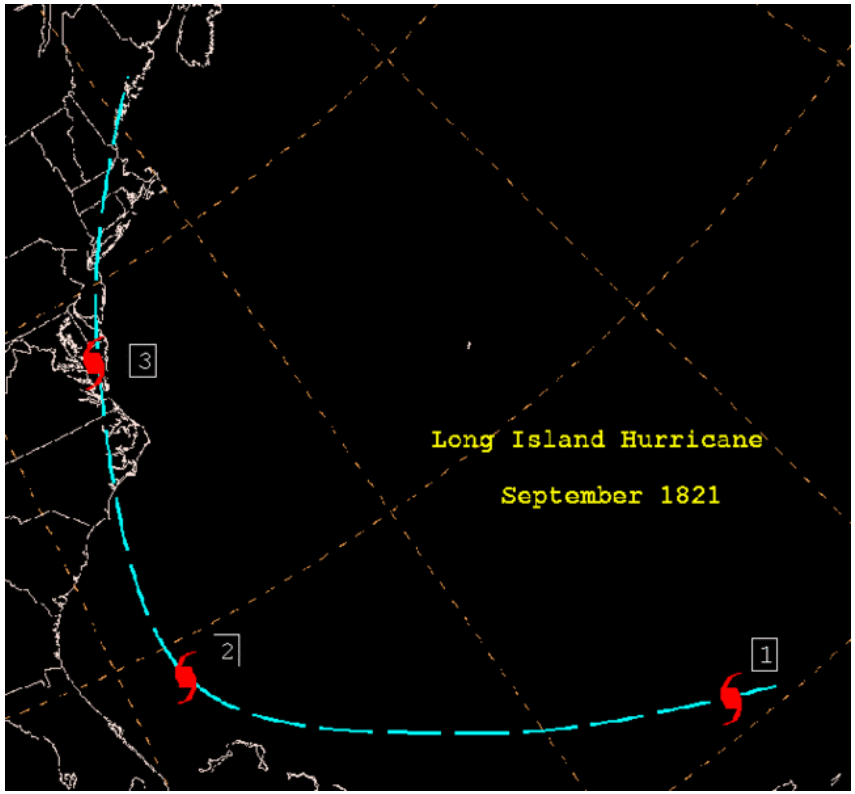


Source: Dunn and Miller (1964)

- Three hurricanes made landfall in New Jersey from the Revolutionary War to Civil War
- Hurricane of August 1778 prevented a British/French naval battle
- “Snowicane” of 1804 struck Atlantic City as a Category 2 in October and dropped over a foot of snow in parts of New England

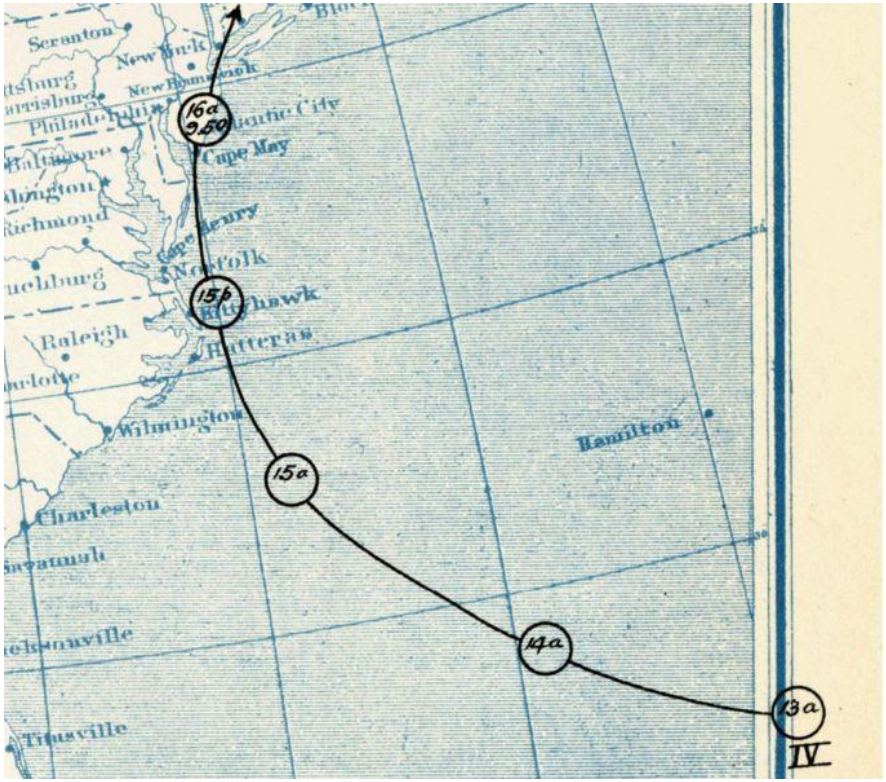
1821 Long Island-Norfolk Hurricane

- Struck Cape May as either a Category 3 or Category 4 hurricane on the Saffir-Simpson Scale
- Storm surge of 29 ft reported
- Second landfall in New York City as a Category 3 hurricane
- Manhattan flooded to Canal Street



Source: NOAA

1903 Vagabond Hurricane



Struck near Atlantic City as a Category 1 hurricane

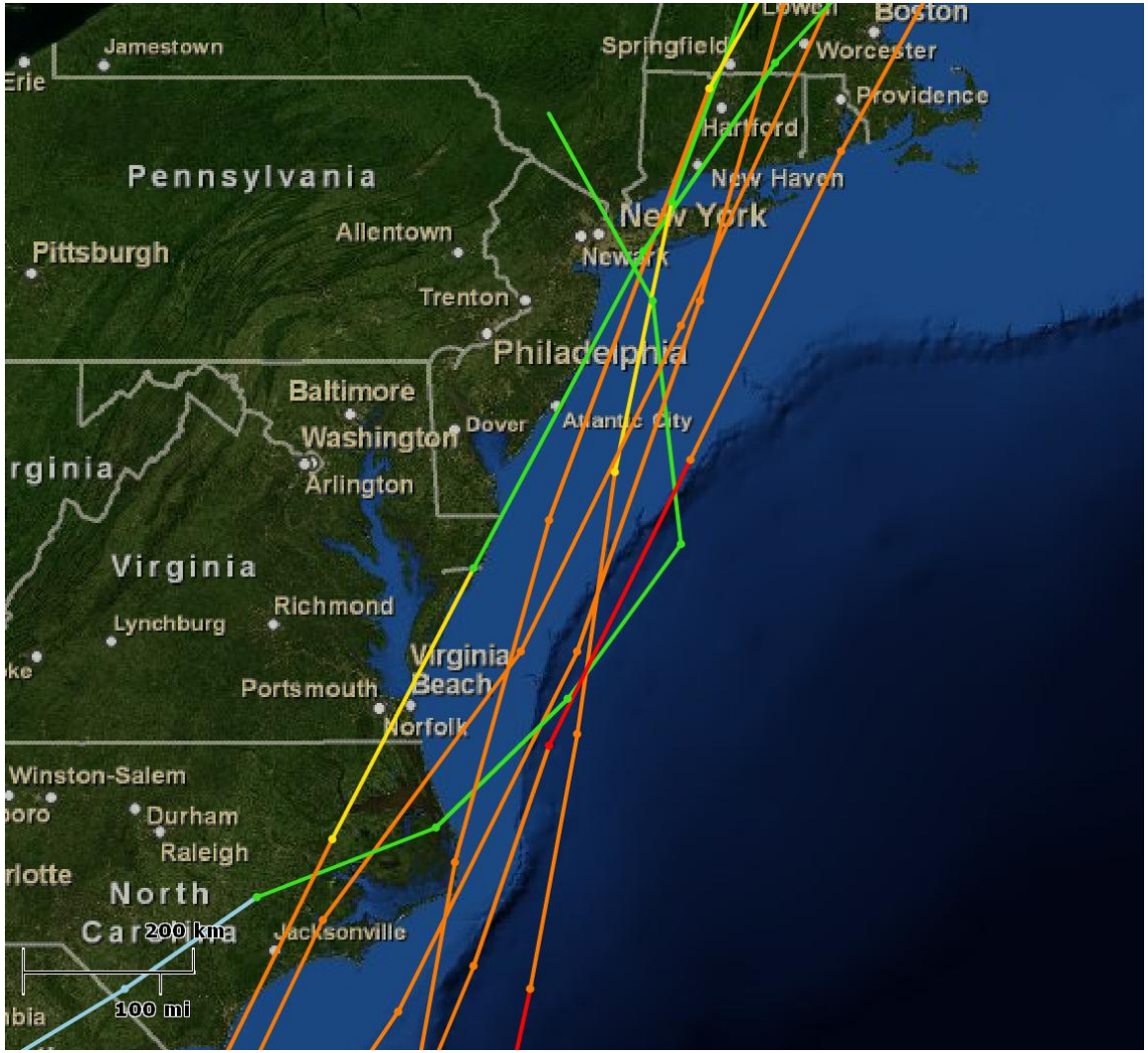
Source: NOAA

1944 Great Atlantic Hurricane

- Paralleled Eastern Seaboard as a Category 3 hurricane before striking Long Island
- No direct landfall on New Jersey
- Close enough passage to do serious damage to Ocean Grove, Asbury Park, LBI, Atlantic City and Cape May
- Most damaging storm in the 20th century

Picture: NOAA

New Jersey Hurricanes: 1950 - 2010

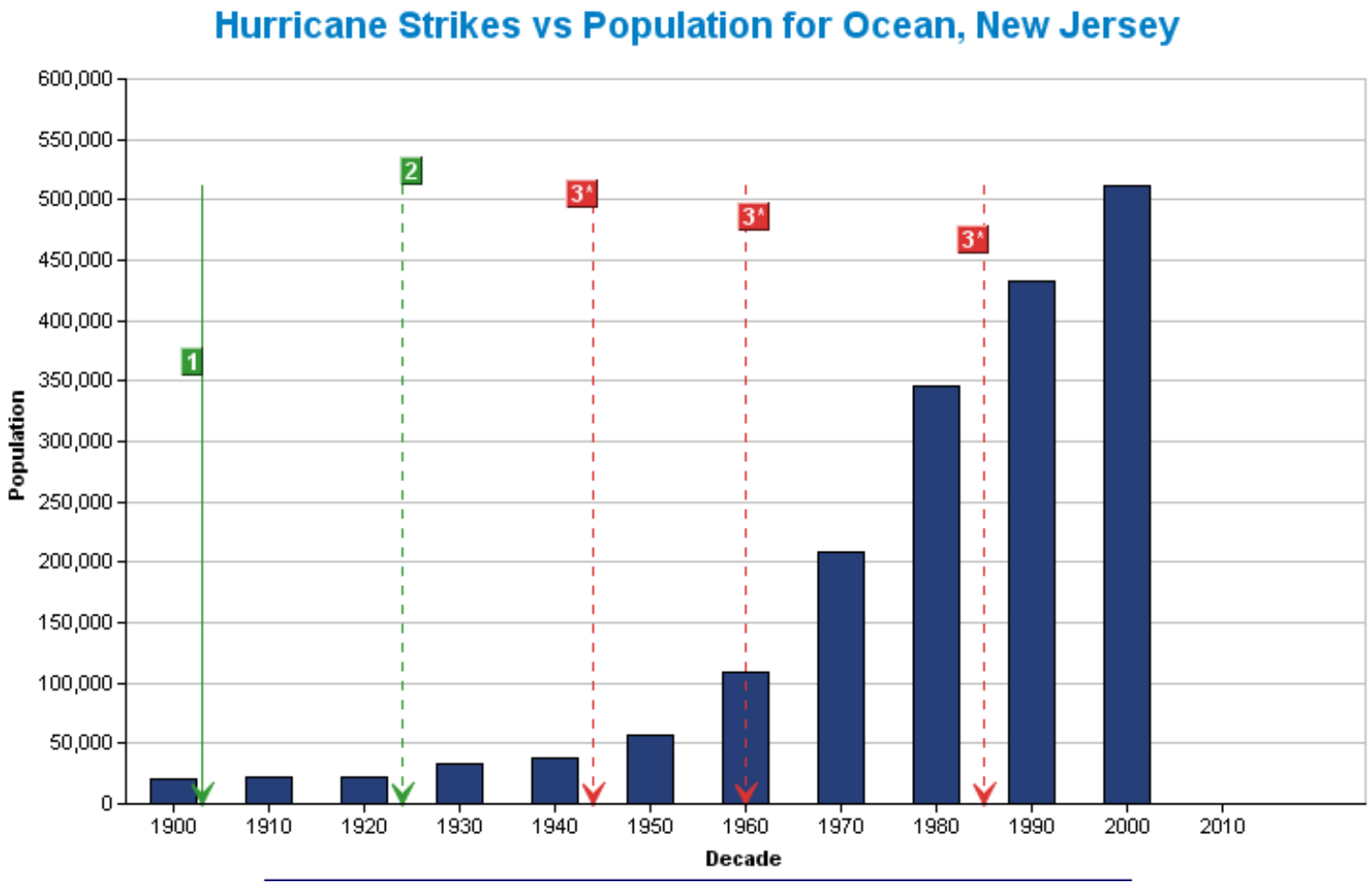


- Carol (1954)
- Donna (1960)
- Agnes (1972)
- Belle (1976)
- Gloria (1985)
- Bob (1991)
- Floyd (1999)

Source: NOAA

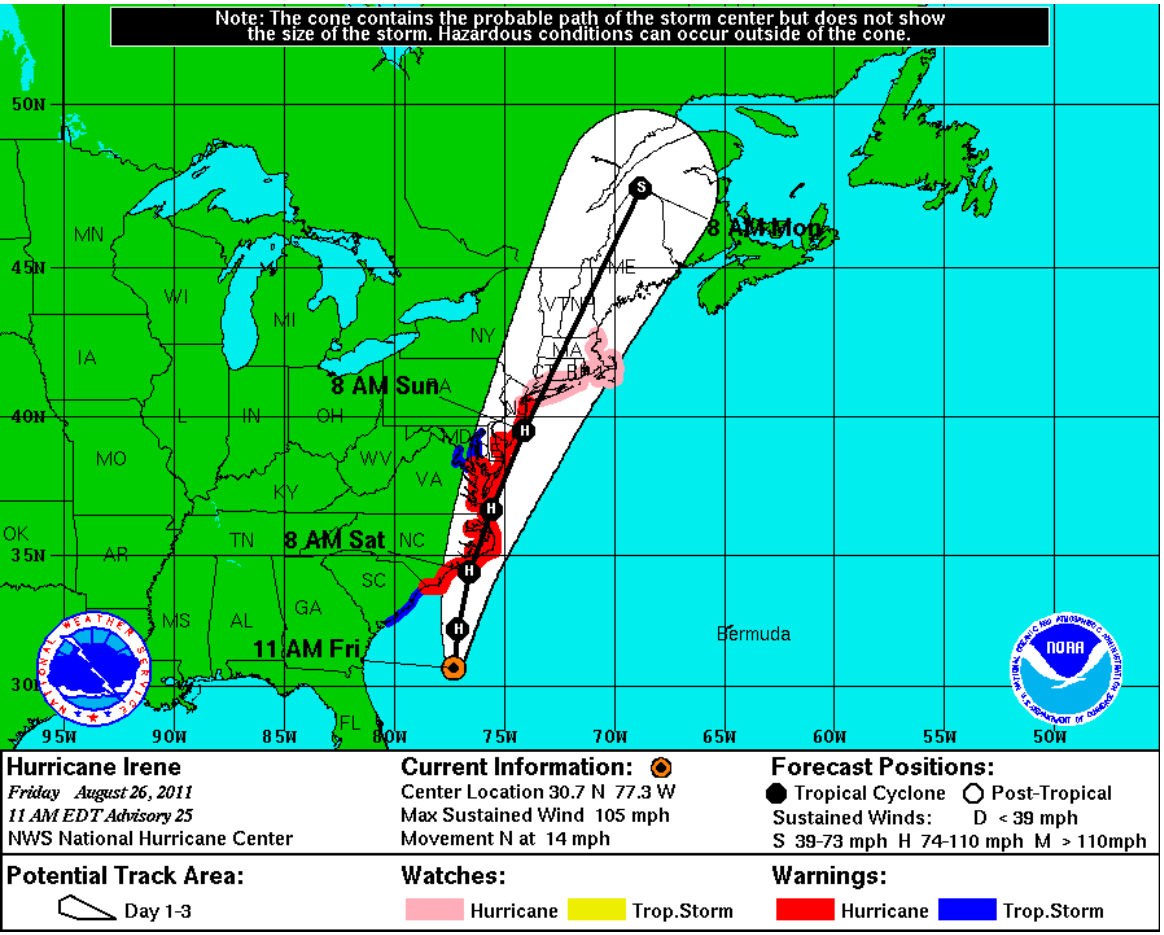
Coastal County Population Growth

Ocean County



Source: NOAA

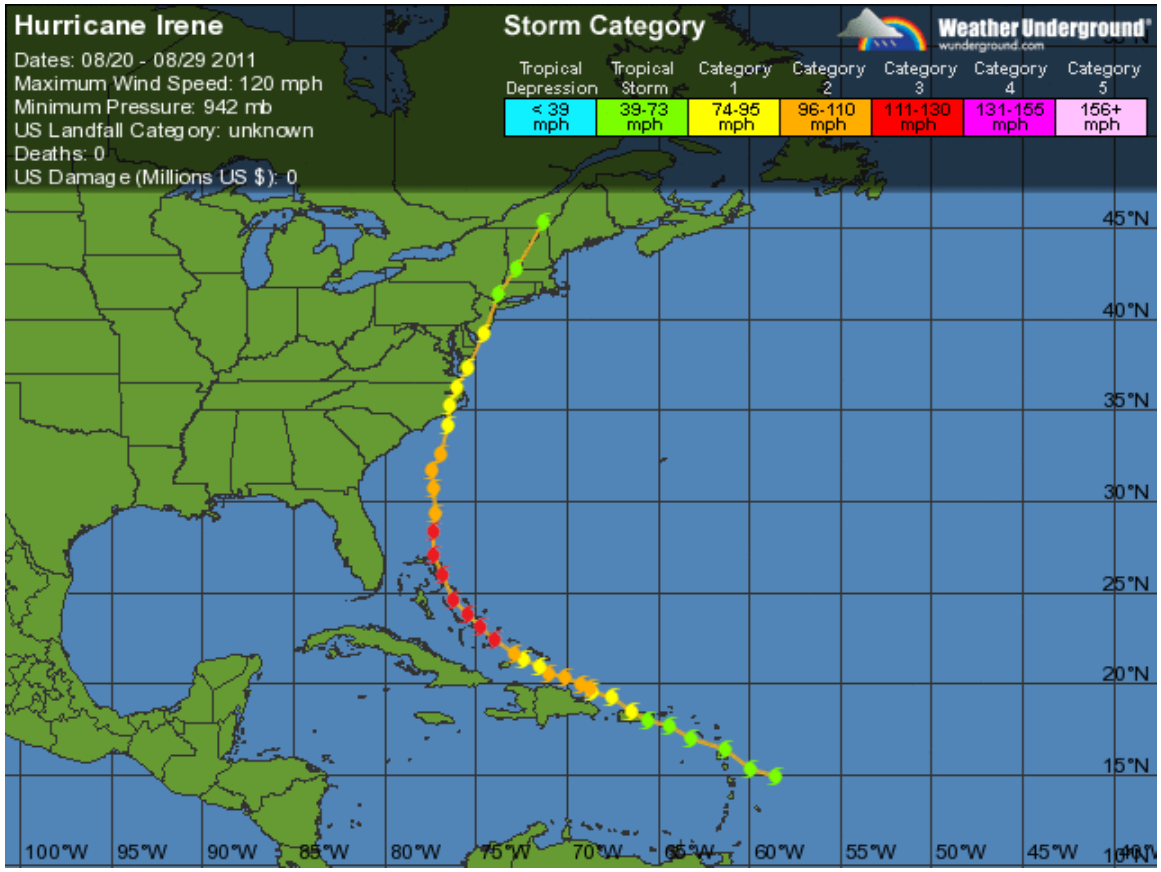
Hurricane Irene
Forecasts



- Forecasted track 48 hours in advance took Irene up the coast and over the barrier islands as a hurricane.
- Prompted a full evacuation of all barrier islands, coastal communities, Hoboken, downtown Manhattan and Jersey City.
- Shut down mass transit and the Garden State Parkway south of Exit 98.

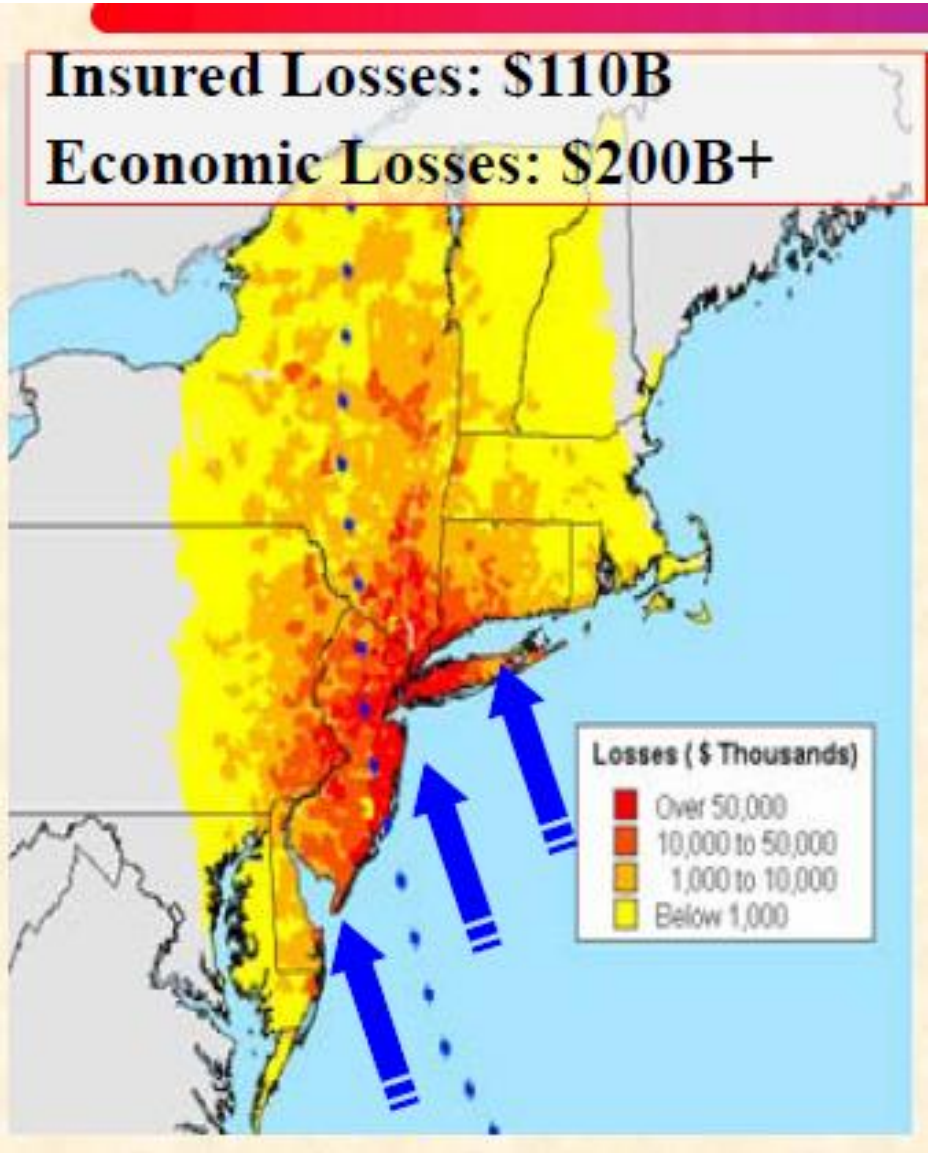
Source: NHC/NOAA

Hurricane Irene
Impacts



Source: Wunderground

- First hurricane to make landfall in New Jersey since 1903.
- Destroyed promenades and piers along the coastline.
- Caused severe flooding inland and prolonged power outages.
- Worst flooding in Vermont and New York in 100 years.
- Estimated $15 billion in economic losses and $3.7 billion in insured losses.
- Estimated $755 million in insured losses in New Jersey.



Source: AIR/III

- Nightmare scenario: Borderline Category 3/4 making landfall in southern Ocean County
- Economic/insured loss potential 2-3 times Hurricane Katrina

Vulnerability of the New York/New Jersey Metro Region

- Top 10 in population vulnerable to coastal flooding
- Second only to Miami in assets exposed to coastal flooding
- Second only to Tokyo, Japan for assets exposed to wind damage
- BAU scenario: $2.5 trillion in assets exposed to sea level rise

Source: OCED

Future Projections

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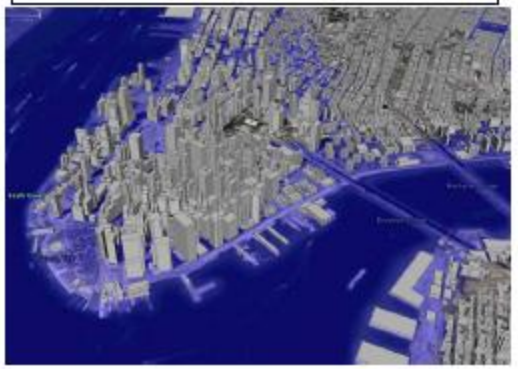
	Extreme Event	Baseline (1971-2000)	2020s	2050s	2080s
Coastal Floods & Storms[4]	1-in-10 yr flood to reoccur, on average	~once every 10 yrs	~once every 8 to 10 yrs	~once every 3 to 6 yrs	~once every 1 to 3 yrs
	Flood heights associated with 1-in-10 yr flood (in feet)	6.3	6.5 to 6.8	7.0 to 7.3	7.4 to 8.2
	1-in-100 yr flood to reoccur, on average	~once every 100 yrs	~once every 65 to 80 yrs	~once every 35 to 55 yrs	~once every 15 to 35 yrs
	Flood heights associated with 1-in-100 yr flood (in feet)	8.6	8.8 to 9.0	9.2 to 9.6	9.6 to 10.5
	1 in 500-yr flood to reoccur, on average	~once every 500 yrs	~once every 380 to 450 yrs	~once every 250 to 330 yrs	~once every 120 to 250 yrs
	Flood heights associated with 1-in-500 yr flood (in feet)	10.7	10.9 to 11.2	11.4 to 11.7	11.8 to 12.6

Risk	Baseline	2020s	2050s	2080s
SLR	--	+2-5 in	+7-12 in	+12-23 in
Rapid ice melt	--	+5-10 in	+19-29 in	+41-55 in

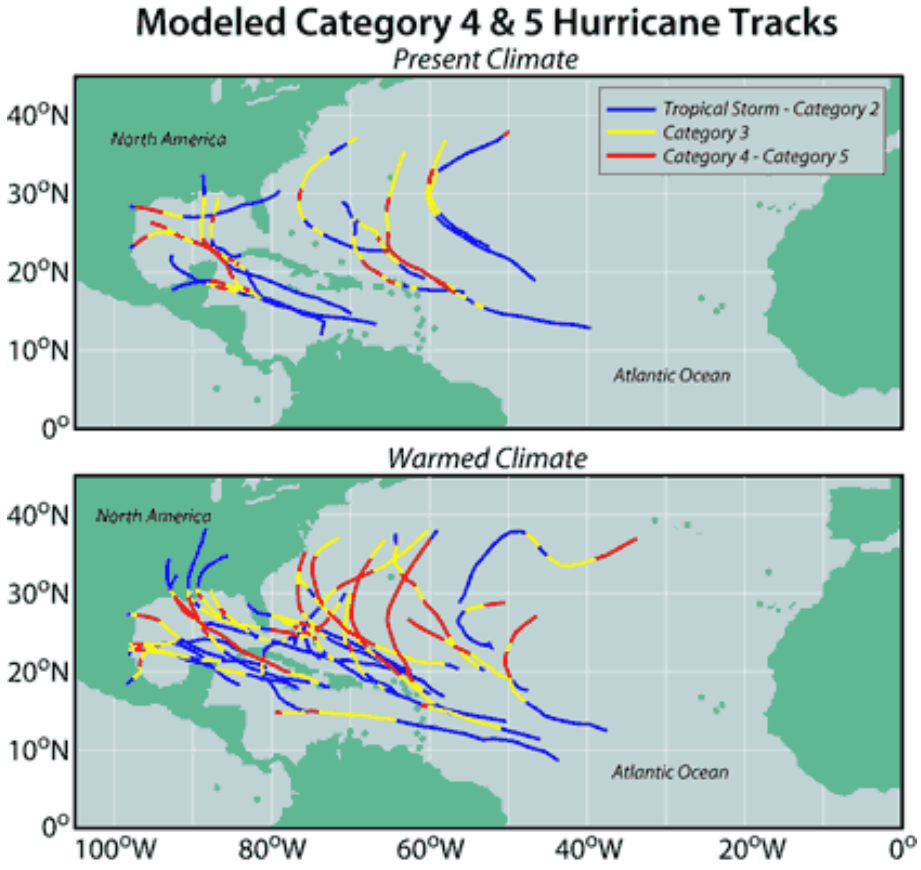
"Worst Case" Storm Surge - 25 Feet



Source: NPCC

Weather Events and Climate Change

- Impossible to determine impact of climate change on individual events
- Recent publications suggest decrease in overall hurricane frequency and an increase in major hurricane frequency



Source: GFDL

How the Insurance Industry Can Help

Reducing Near-Term Budget Fluctuations

Index-based weather cover

- Simple, transparent solution which allows state or municipalities to quickly receive funds to offset costs incurred by weather variability.
- Almost any weather variable can be used: snowfall, precipitation, temperature, heating degree days.
- Bespoke structures are designed to fit budgets and provide maximum protection for premium paid.

How the Insurance Industry Can Help

Planning for Future Financial Costs

Industry Catastrophe models

- Computer models which combine scientific, engineering, economic and financial principles provide insurers with projections of loss severity and loss frequency
- Models contain hazard sets, which are hundreds of thousands of physically plausible but non-historical events, such as earthquakes, hurricanes, floods, blizzards and tornadoes
- Input is a portfolio which contains information about the location, construction and value of each individual risk.
- Output gives expected loss values across various return periods and the annual average loss.
- Models can be tweaked to account for climate change by altering the frequency or the severity of different simulated events.
- Output then reflects losses expected in a new climate regime.