National Park Service
U.S. Department of the Interior

Gateway National Recreation Area

Planning for Changing Climate Conditions: Assessing Climate Change Impacts on Gateway National Recreation Area

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INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE

UNEP

2500+ scientific expert reviewers

800+ contributing authors and

450+ lead authors from

130+ countries

6 years work

4 volumes

1 Report

Paris, 2 February 07

The first volume will be released.

- What progress has been made in understanding and attributing climate change?
- What do observations of the atmosphere, oceans, sea level, snow and ice tell us?
- How has climate been behaving in the last hundreds of thousands years?
- Which are the projections of future changes?

Find the latest information on "The Physical Science Basis of Climate Change" in Working Group I report

Projected future changes in the physical climate system:

- Warming is expected to be about 0.4 C during next 20 years
- GHG emissions at or above current rates would cause further warming and induce many changes in climate during the 21st century that would *very likely* be larger than those observed during the 20th century.
- Warming is projected to be greatest over land and at high latitudes in the northern hemisphere
- *Likely* hurricanes will increase in intensity

Arctic Sea Ice Decline

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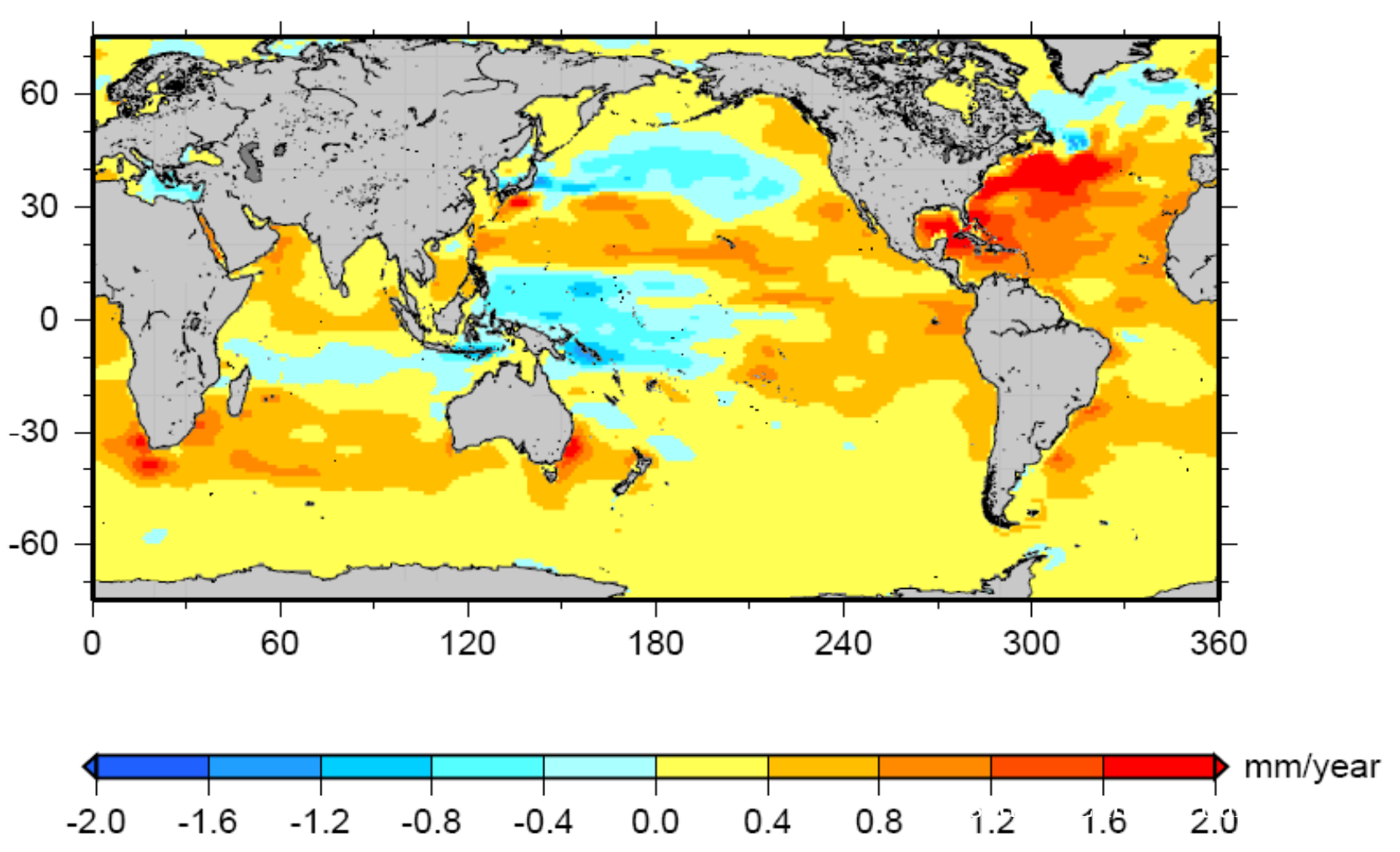
Regional trend of sea level rise from 1950 to 2000



Coastal Impacts

Coasts are already experiencing the adverse consequences of hazards related to climate and sea level [very high confidence].

Coasts will be exposed to increasing risks over coming decades due to many compounding climate-change factors [very high confidence].

Most low-lying coastal areas are vulnerable to sea-level rise and climate change. Coastal wetland ecosystems, such as salt marshes are especially threatened where they are sediment-starved or constrained on their landward margin [very high confidence].

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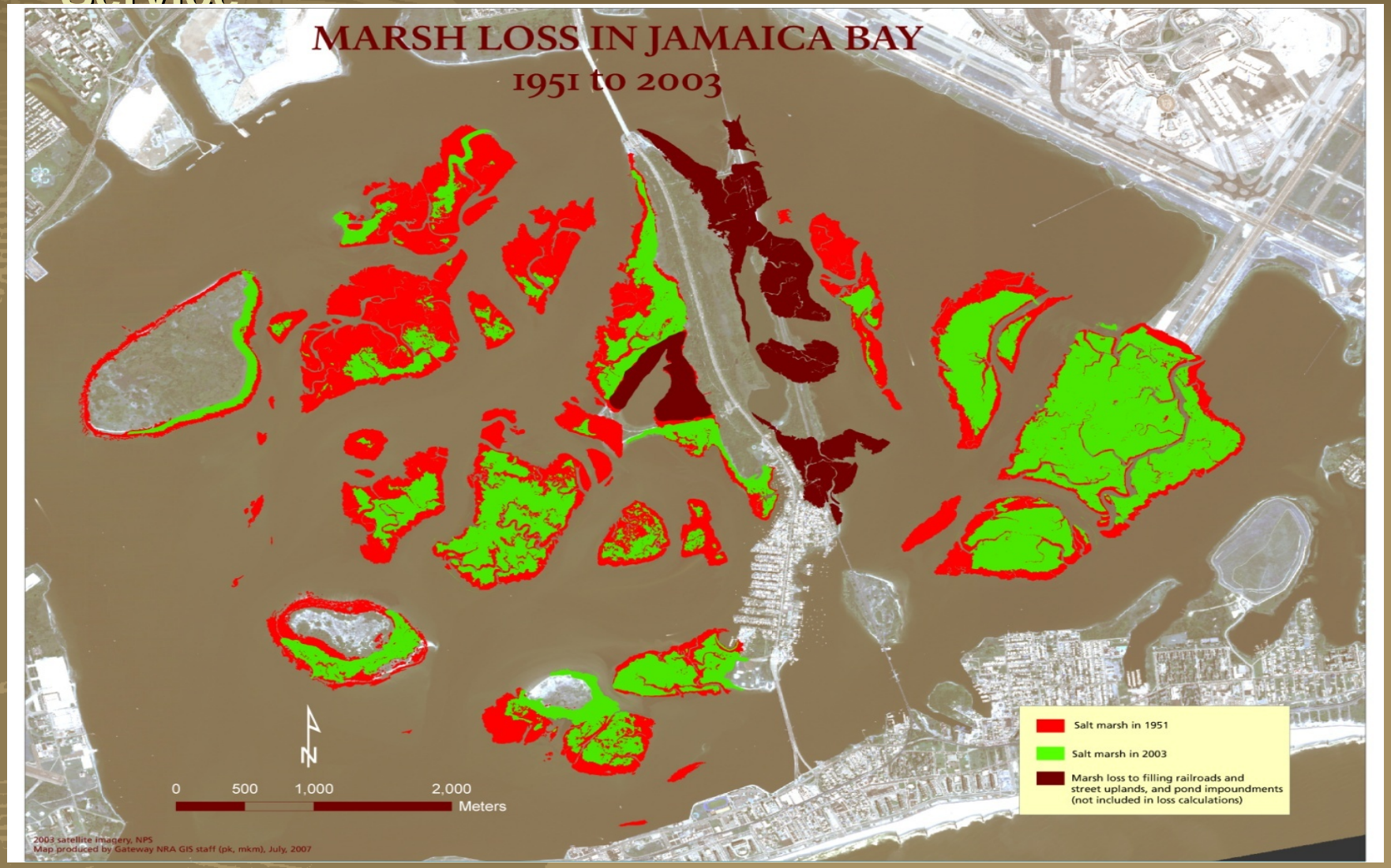

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Indicators of Climate Change in the Northeast US over the last 30-40 yrs

- Winter warming
- Decreased snowfall
- Fewer days with snow on ground
- Lake ice out dates earlier
- Lilac bloom dates earlier
- More frequent extreme precipitation
- Earlier spring runoff
- Sea levels continuing to rise

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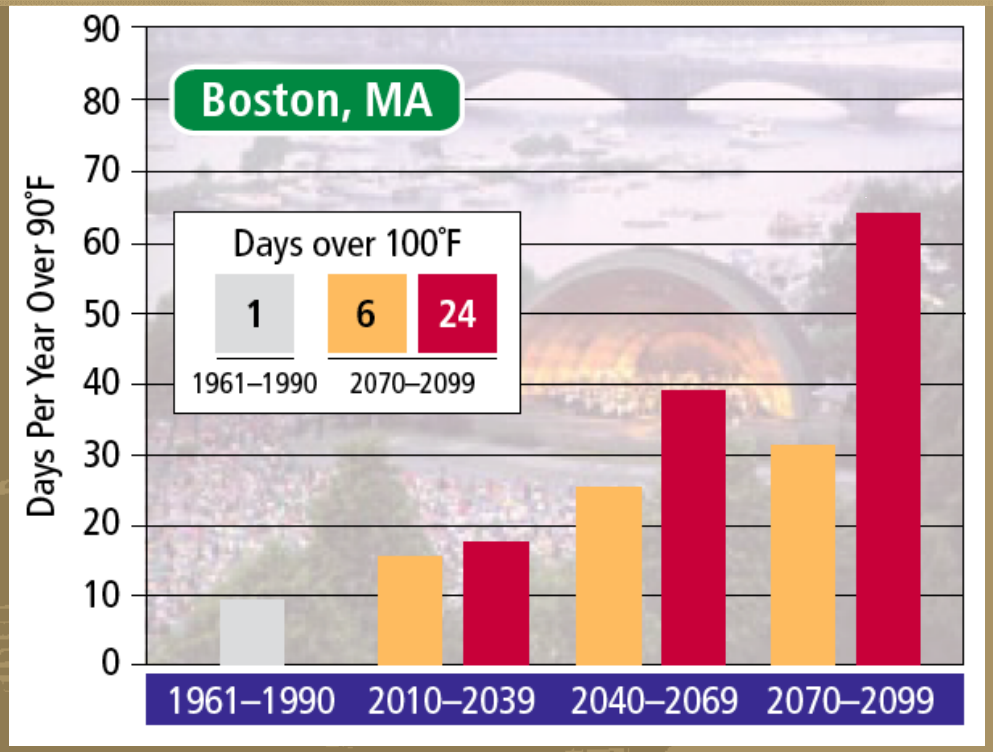
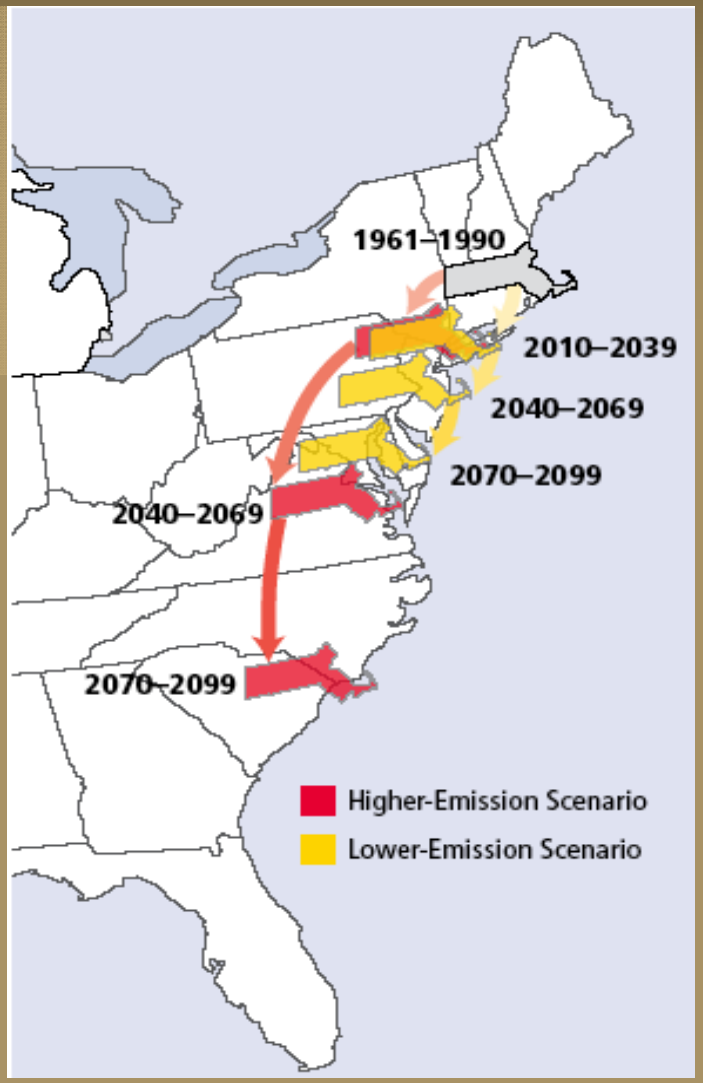
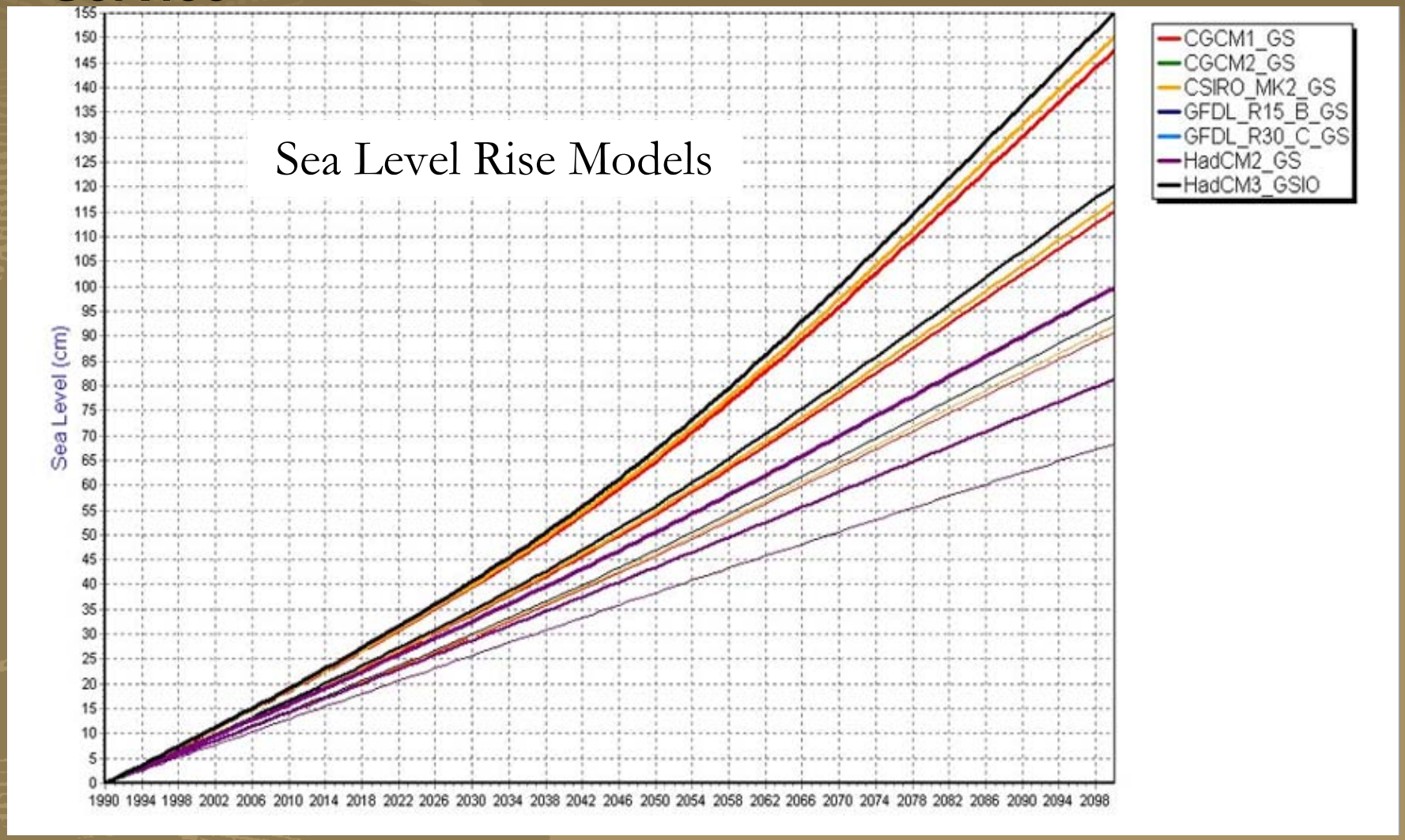
Summer heat index:

How hot summers will "feel" in

Massachusetts






Sea Level Rise Models
Sea Level (cm)
155
150
145
140
135
130
125
120
115
110
105
100
95
90
85
80
75
70
65
60
55
50
45
40
35
30
25
20
15
10
5
0
1990 1994 1998 2002 2006 2010 2014 2018 2022 2026 2030 2034 2038 2042 2046 2050 2054 2058 2062 2066 2070 2074 2078 2082 2086 2090 2094 2098
CGCM1_GS
CGCM2_GS
CSIRO_MK2_GS
GFDL_R15_B_GS
GFDL_R30_C_GS
HadCM2_GS
HadCM3_GSIO

Changing Elevation above MSL Under a Variety of Scenarios

Location	Distance above MSL (ft)	Conservative Estimate 2020	Conservative Estimate 2050	Conservative Estimate 2080	Effect of Rapid Ice Melt 2020	Effect of Rapid Ice Melt 2050	Effect of Rapid Ice Melt 2080
Jamaica Bay Unit							
Ryan Center (FBF)	13.72	13.56	13.14	12.72	12.89	11.31	9.14
Canarsie Pier Entrance	8.47	8.31	7.89	7.47	7.64	6.06	3.89
Riis Bath House: Steps	10.08	9.92	9.50	9.08	9.25	7.67	5.50
Riis Bath House: Beach	4.11	3.94	3.53	3.11	3.28	1.69	-0.47
Wildlife Refuge VC	22.71	22.54	22.13	21.71	21.88	20.29	18.13
Staten Island							
Battery Weed Entrance	10.97	10.80	10.39	9.97	10.14	8.55	6.39
Fort Tompkins	117.99	117.83	117.41	116.99	117.16	115.58	113.41
Miller Field Ranger Station	9.82	9.65	9.24	8.82	8.99	7.40	5.24
Great Kills Bath House	9.59	9.42	9.01	8.59	8.76	7.17	5.01
Sandy Hook							
Sandy Hook Lighthouse	14.29	14.12	13.71	13.29	13.46	11.87	9.71
Ranger Station	11.57	11.40	10.98	10.57	10.73	9.15	6.98
History House	6.98	6.81	6.39	5.98	6.14	4.56	2.39

Note: 1) Does not include effect of tectonic plate subsidence and compaction

2) Mean Sea Level Rise model based on New York City Panel on Climate Change report on Climate Risk Information.

3) NAVD 88 Datum used for all elevations

4) Sandy Hook NJ and The Battery New York 1983 - 2001 Epoch referenced.

Changing Elevation above MSL Under a Variety of Scenarios

1992 Nor'easter 7.7 ft surge

Location	Distance above MSL (ft)	Conservative Estimate 2020	Conservative Estimate 2050	Conservative Estimate 2080	Effect of Rapid Ice Melt 2020	Effect of Rapid Ice Melt 2050	Effect of Rapid Ice Melt 2080
Jamaica Bay Unit							
Ryan Center (FBF)	13.72	5.86	5.44	5.02	5.19	3.61	1.44
Canarsie Pier Entrance	8.47	0.61	0.19	-0.23	-0.06	-1.64	-3.81
Riis Bath House: Steps	10.08	2.22	1.80	1.38	1.55	-0.03	-2.20
Riis Bath House: Beach	4.11	-3.76	-4.17	-4.59	-4.42	-6.01	-8.17
Wildlife Refuge VC	22.71	14.84	14.43	14.01	14.18	12.59	10.43
Staten Island							
Battery Weed Entrance	10.97	3.10	2.69	2.27	2.44	0.85	-1.31
Fort Tompkins	117.99	110.13	109.71	109.29	109.46	107.88	105.71
Miller Field Ranger Station	9.82	1.95	1.54	1.12	1.29	-0.30	-2.46
Great Kills Bath House	9.59	1.72	1.31	0.89	1.06	-0.53	-2.69
Sandy Hook							
Sandy Hook Lighthouse	14.29	6.42	6.01	5.59	5.76	4.17	2.01
Ranger Station	11.57	3.70	3.28	2.87	3.03	1.45	-0.72
History House	6.98	-0.89	-1.31	-1.72	-1.56	-3.14	-5.31

Note: 1) Does not include effect of tectonic plate subsidence and compaction

2) Mean Sea Level Rise model based on New York City Panel on Climate Change report on Climate Risk Information.

3) NAVD 88 Datum used for all elevations

4) Sandy Hook NJ and The Battery New York 1983 - 2001 Epoch referenced.

Changing Elevation above MSL Under a Variety of Scenarios
1960 Hurricane Donna (Cat 3) 8.4 ft above Sea level

Location	Distance above MSL (ft)	Conservative Estimate 2020	Conservative Estimate 2050	Conservative Estimate 2080	Effect of Rapid Ice Melt 2020	Effect of Rapid Ice Melt 2050	Effect of Rapid Ice Melt 2080
Jamaica Bay Unit							
Ryan Center (FBF)	13.72	5.16	4.74	4.32	4.49	2.91	0.74
Canarsie Pier Entrance	8.47	-0.09	-0.51	-0.93	-0.76	-2.34	-4.51
Riis Bath House: Steps	10.08	1.52	1.10	0.68	0.85	-0.73	-2.90
Riis Bath House: Beach	4.11	-4.46	-4.87	-5.29	-5.12	-6.71	-8.87
Wildlife Refuge VC	22.71	14.14	13.73	13.31	13.48	11.89	9.73
Staten Island							
Battery Weed Entrance	10.97	2.40	1.99	1.57	1.74	0.15	-2.01
Fort Tompkins	117.99	109.43	109.01	108.59	108.76	107.18	105.01
Miller Field Ranger Station	9.82	1.25	0.84	0.42	0.59	-1.00	-3.16
Great Kills Bath House	9.59	1.02	0.61	0.19	0.36	-1.23	-3.39
Sandy Hook							
Sandy Hook Lighthouse	14.29	5.72	5.31	4.89	5.06	3.47	1.31
Ranger Station	11.57	3.00	2.58	2.17	2.33	0.75	-1.42
History House	6.98	-1.59	-2.01	-2.42	-2.26	-3.84	-6.01

Note: 1) Does not include effect of tectonic plate subsidence and compaction.
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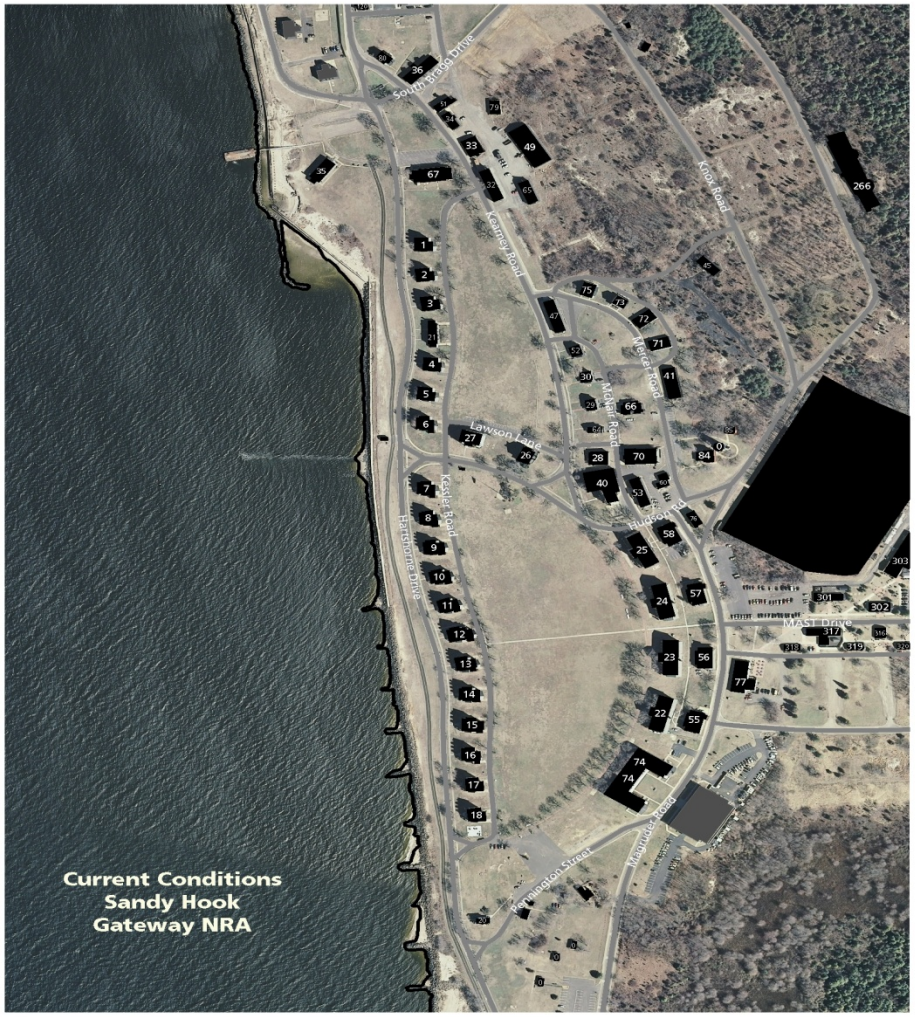

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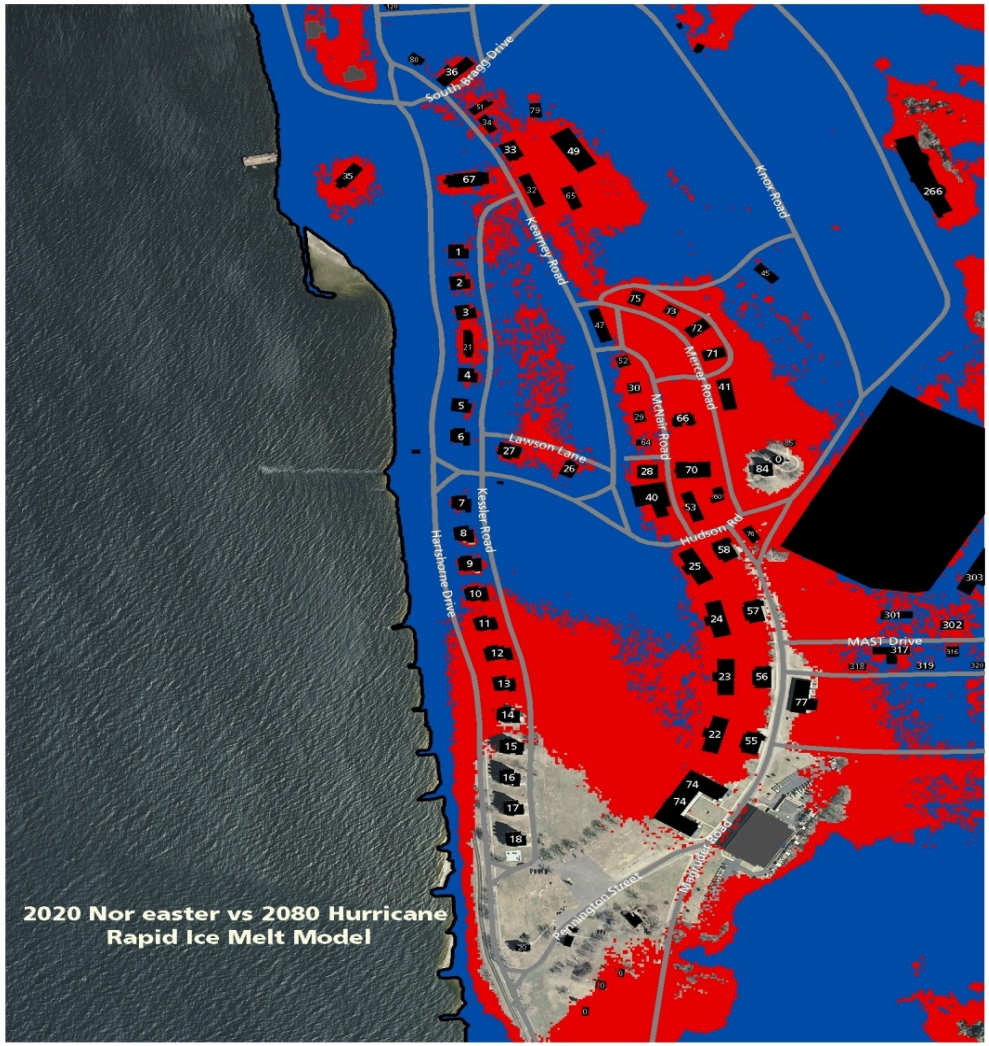

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- Adaptation issue areas and examples of options
- Coastal Impacts From Sea-Level Rise
  - Protect and Restore Coastal Ecosystems
  - Restore Wetlands
  - Restore Natural Shorelines
  - Reduce Structures in Coastal Zones
  - Restore Natural Dune Systems
  - Develop Workshops to Share Information

- How can we manage parks unimpaired for future generations?
  - Apply both adaptation and mitigation techniques
  - Plan for the effects of climate change (GMP)
  - Partner more broadly to protect species and ecological processes across geographic areas.
  - Recognize that parks are more important now than ever before as a refuge for biodiversity.
  - Take greater action to reduce stressors such as exotics and air pollution.

- How can we adapt to an issue that is outside of our control?
  - Identify the areas where we can have influence.
  - Partner more broadly to protect species and ecological processes across geographic areas.
  - Use the issue as an opportunity for education about the dynamic nature of ecosystems, interdependence of resources, and effects of climate change on park resources.
  - Set an example for others by taking action to reduce our own impacts.

- What role could the NPS have in engaging this topic?
  - Communicate the science of climate change and its effects on parks to the public.
  - Recognize the significance of climate change to our Core Mission.
  - Develop strategies to conserve biodiversity in the face of changing climate.
  - Become examples of sustainability.

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