

Assessment of Climate Change Impacts and Solutions in the Great Bay Watershed

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5 Feb 2013, Durham, NH

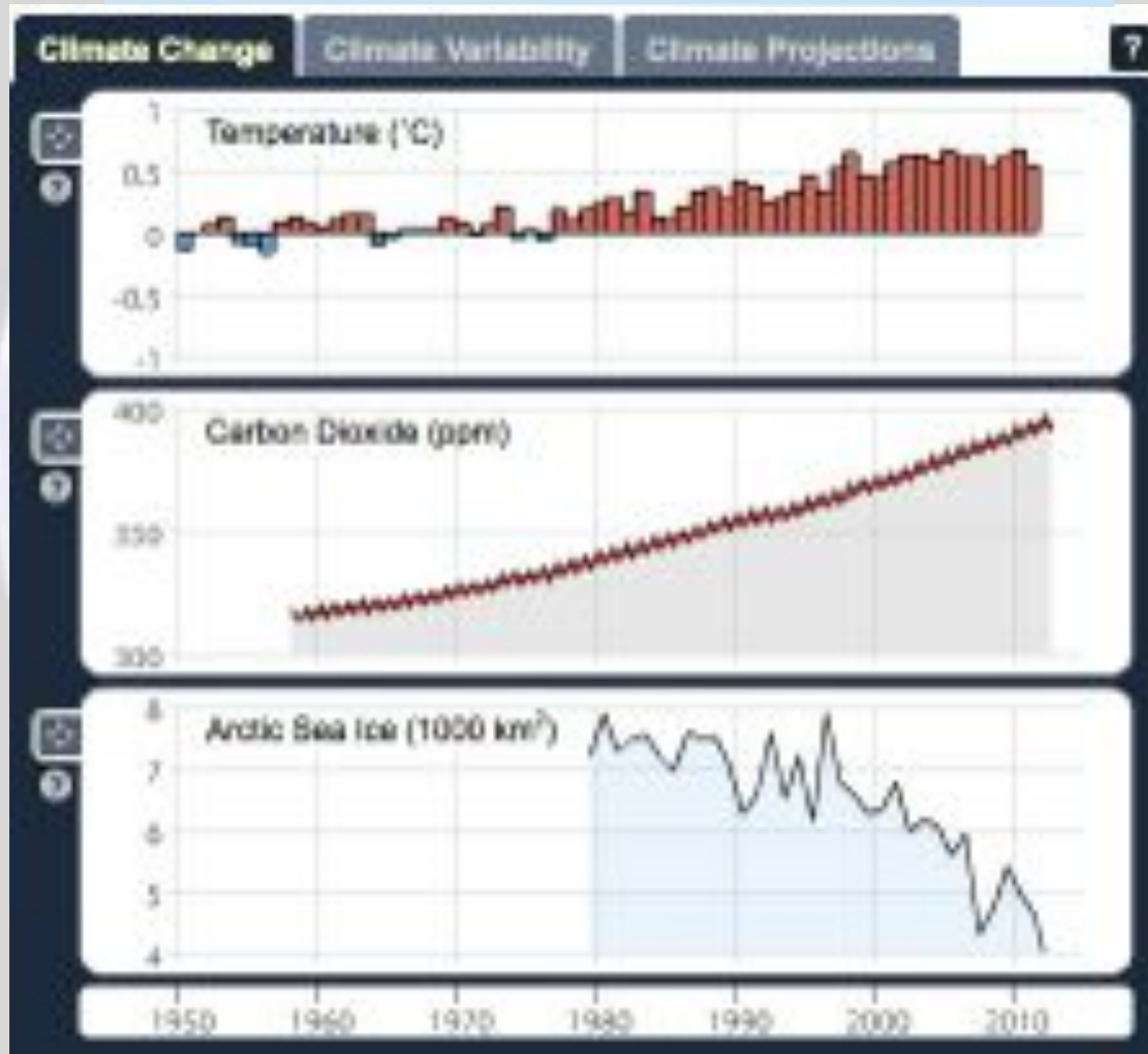
Were You Ready for the Storm?



NASA Earth Observatory Image 30 October 2011



Climate.gov
science and services for society



<http://www.climate.gov>

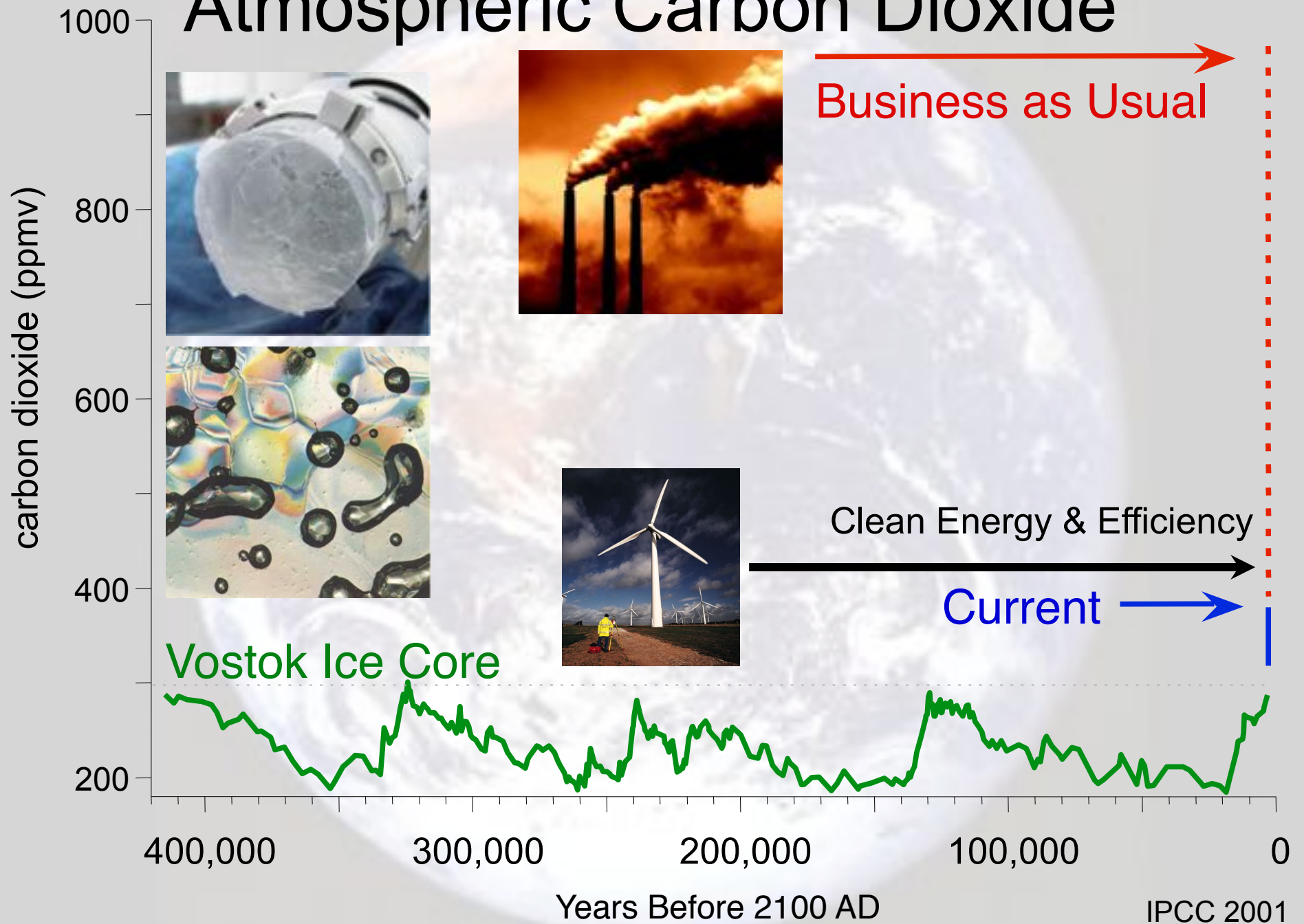
Although they produce distinct types of challenges, climate change, energy security, and economic stability are inextricably linked.

Quadrennial Defense Review 2011

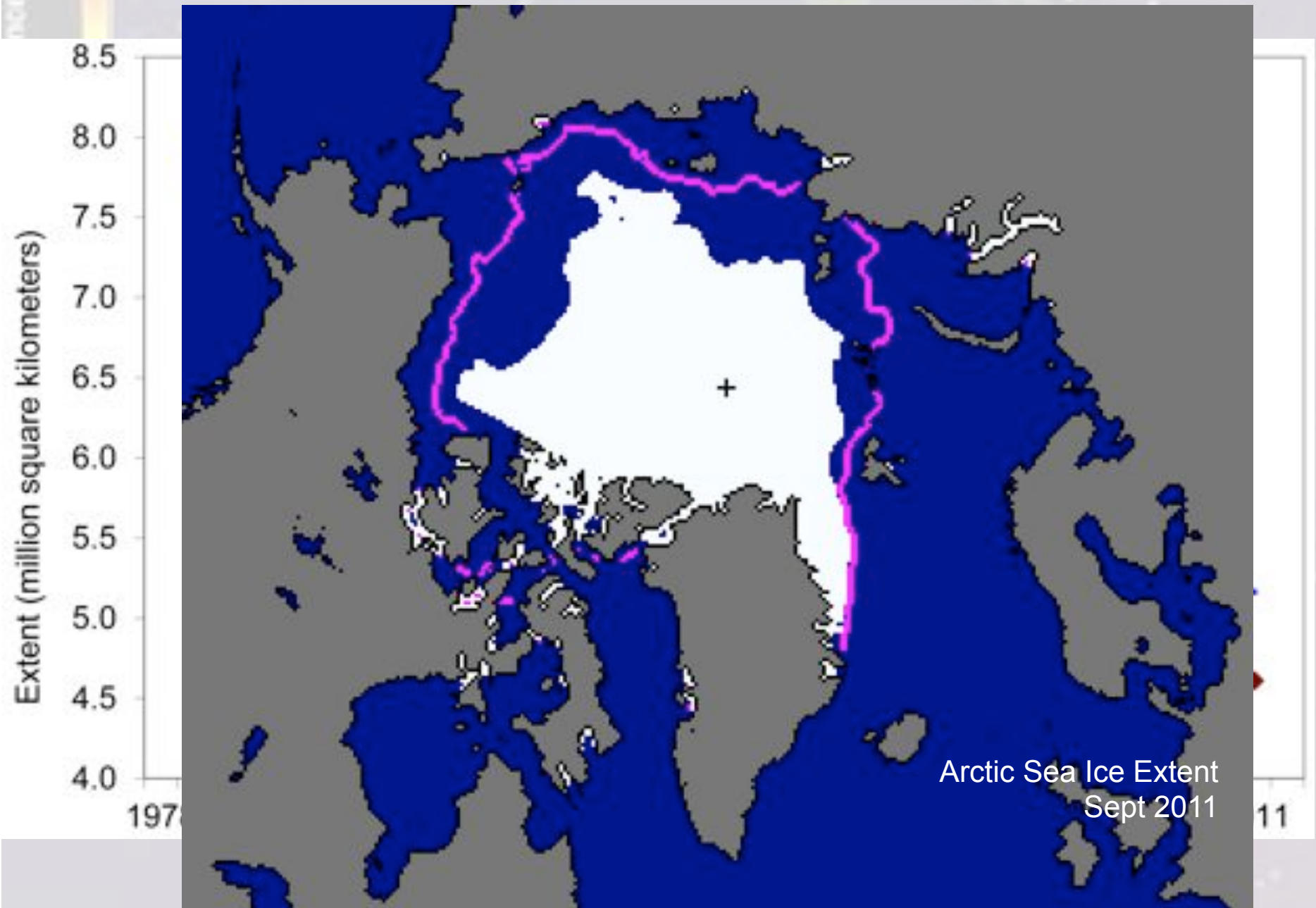


<http://www.defense.gov/qdr/>

Atmospheric Carbon Dioxide



September Arctic Sea Ice Extent 1979 - 2011



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Climate Change in the Piscataqua/Great Bay Region: Past, Present, and Future



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NH Coastal Watershed

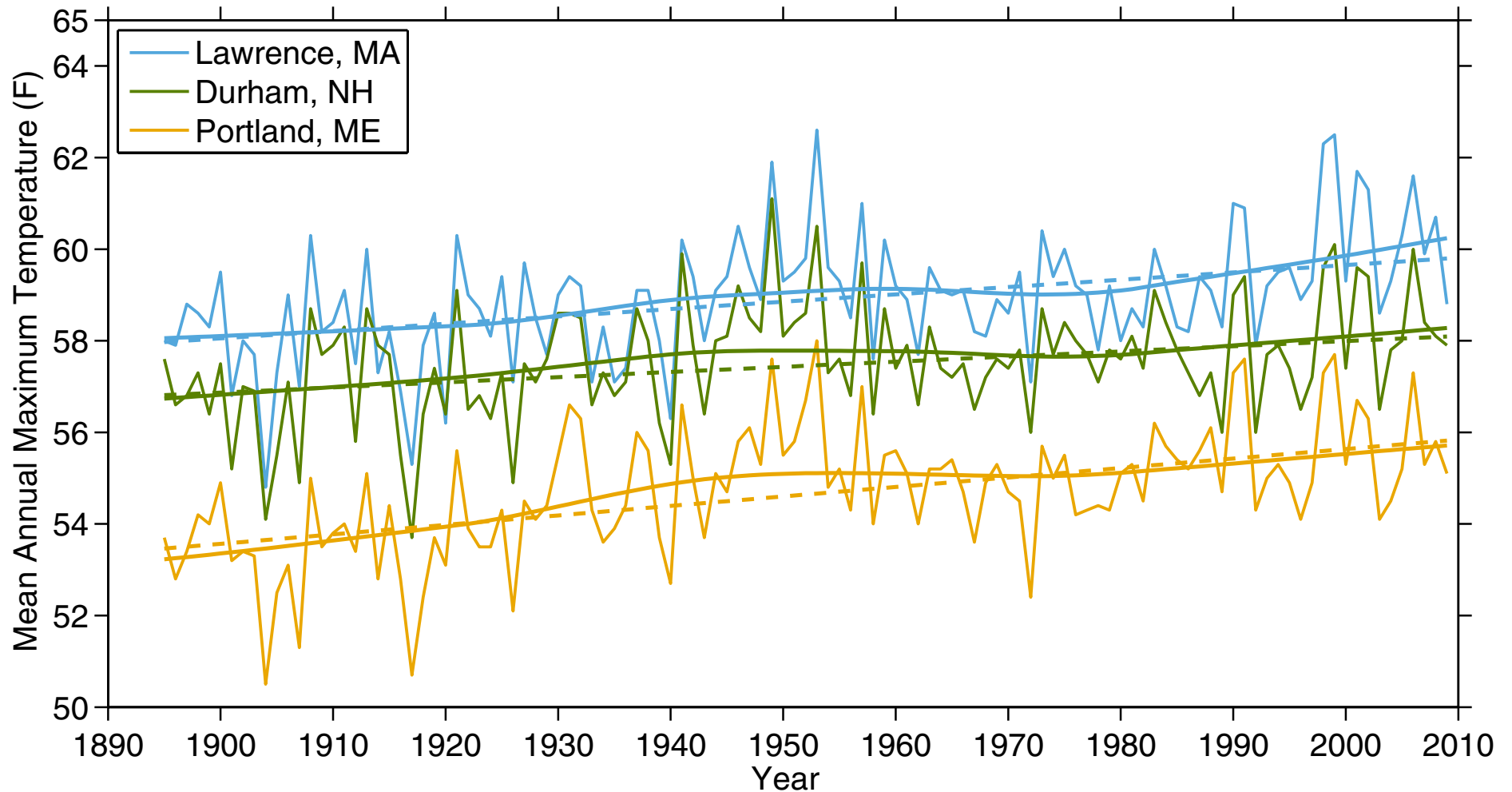


Portsmouth Harbor, 11 Feb 1918



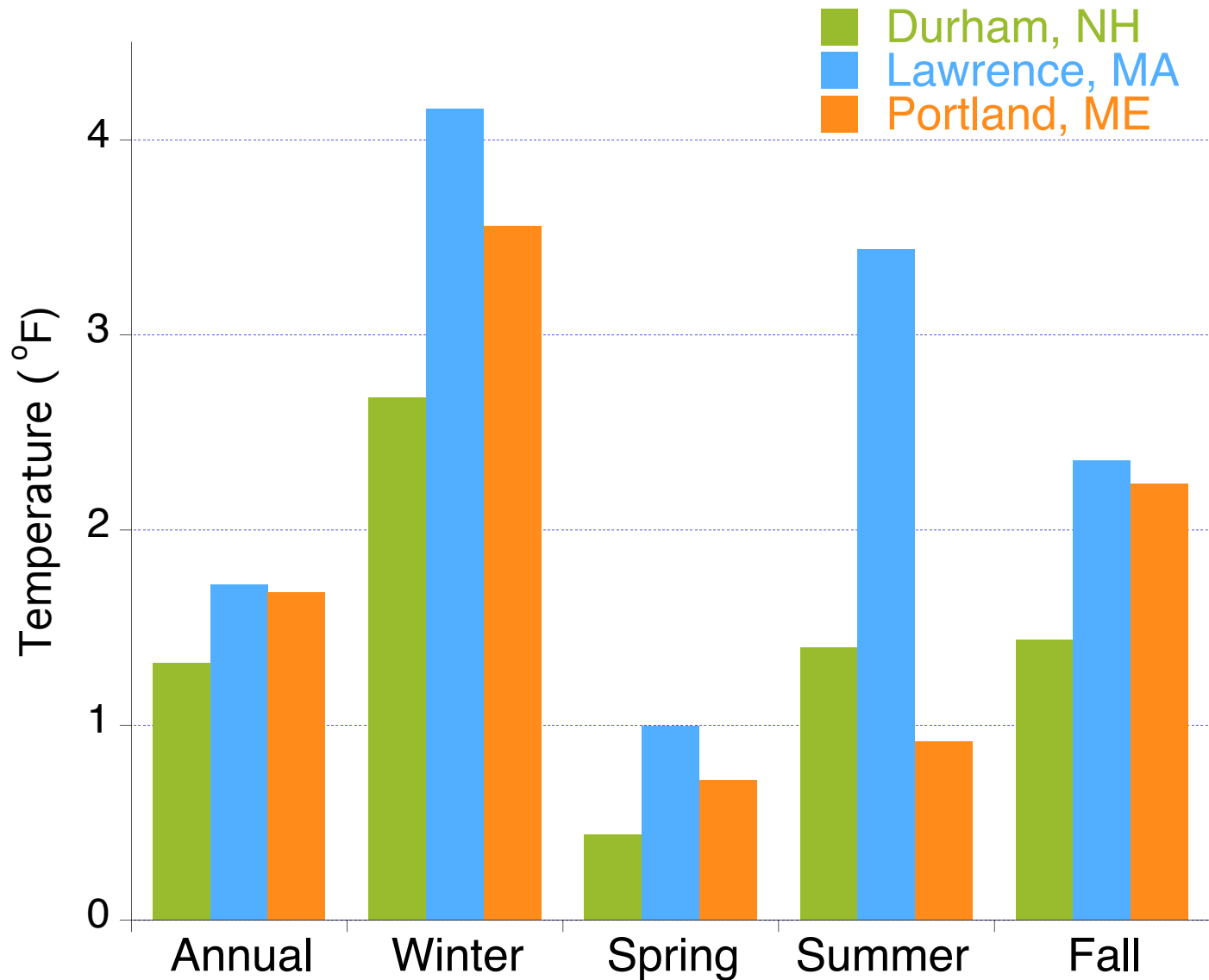
Thomas C Wilson Photograph Collection; Image Provided by Portsmouth Athanaeum

Annual Maximum Temperature

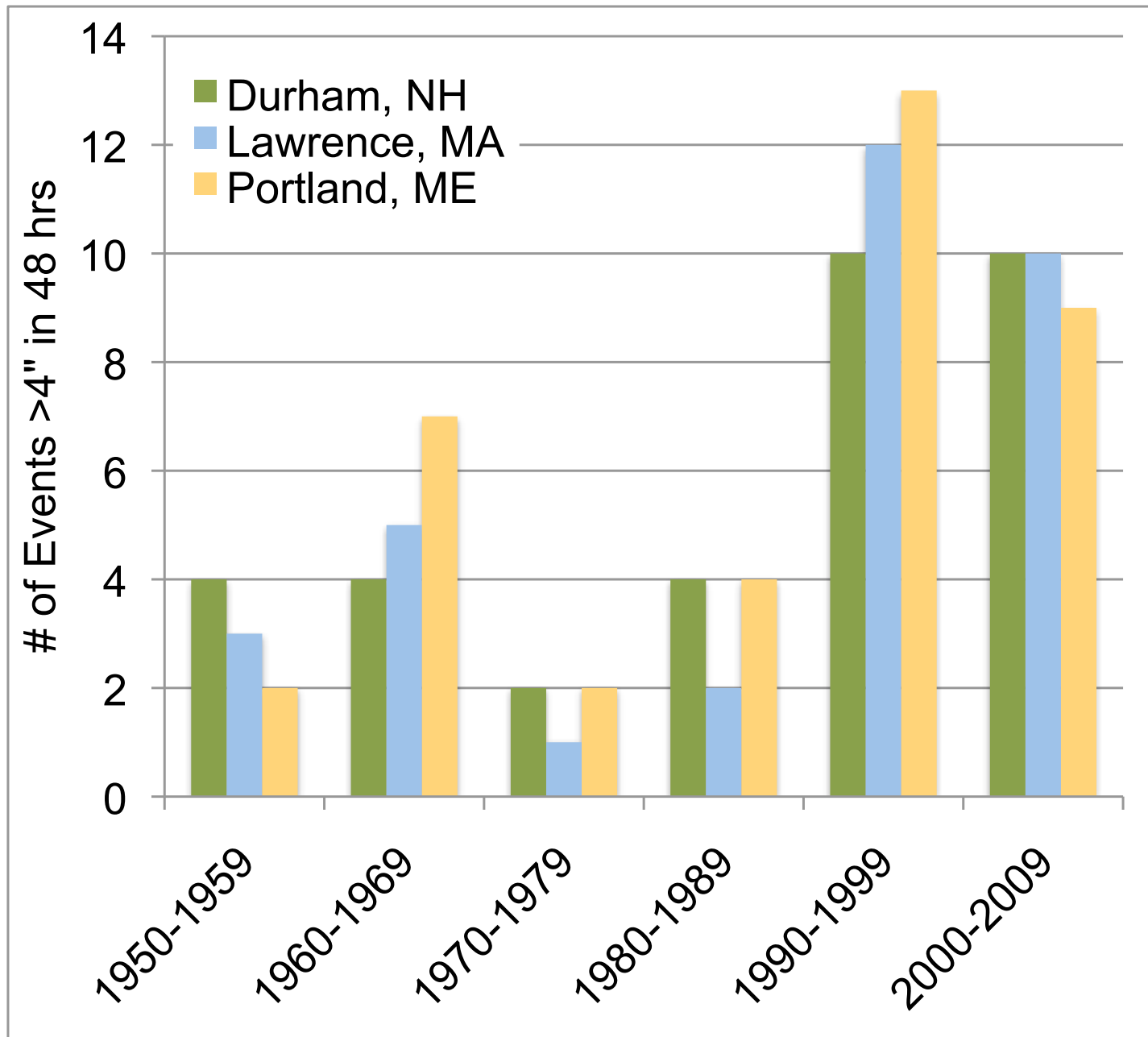


Data from the United States Historical Climate Network Temperature Database V2

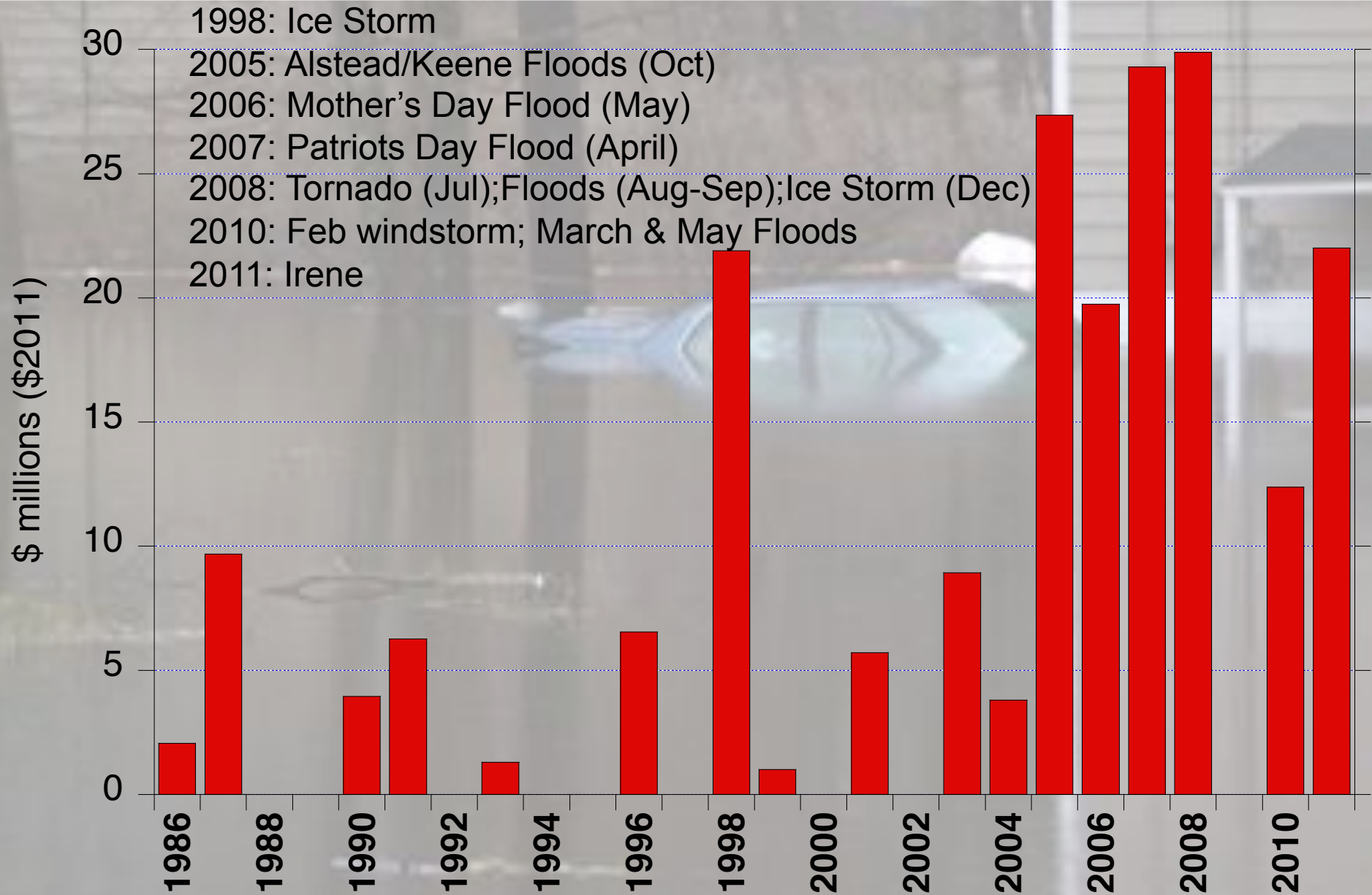
Seasonal Mean Temperature Trends 1970-2009



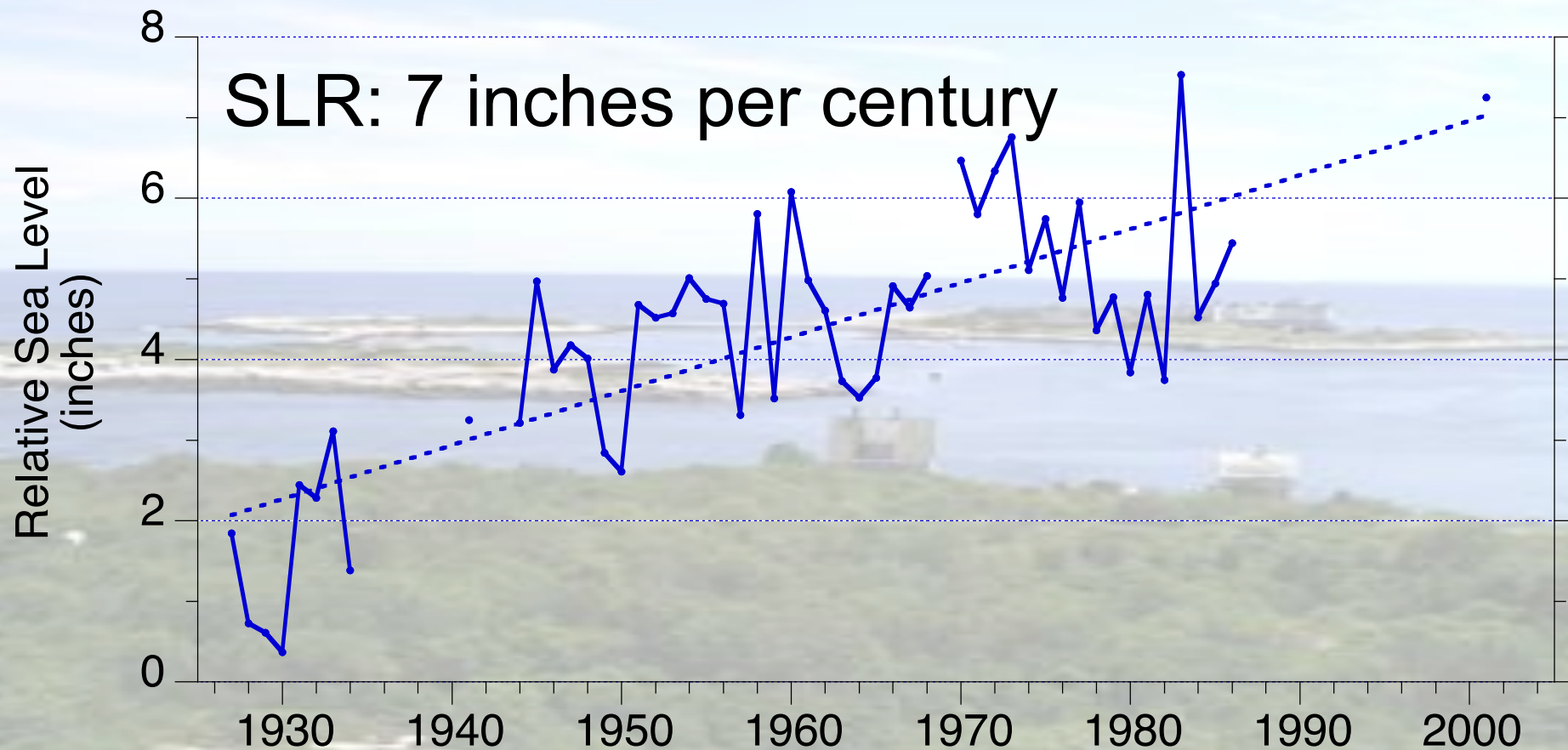
Extreme Precipitation Events (>4") 1950-2009



Costs from Presidentially Declared Disasters And Emergency Declarations in NH

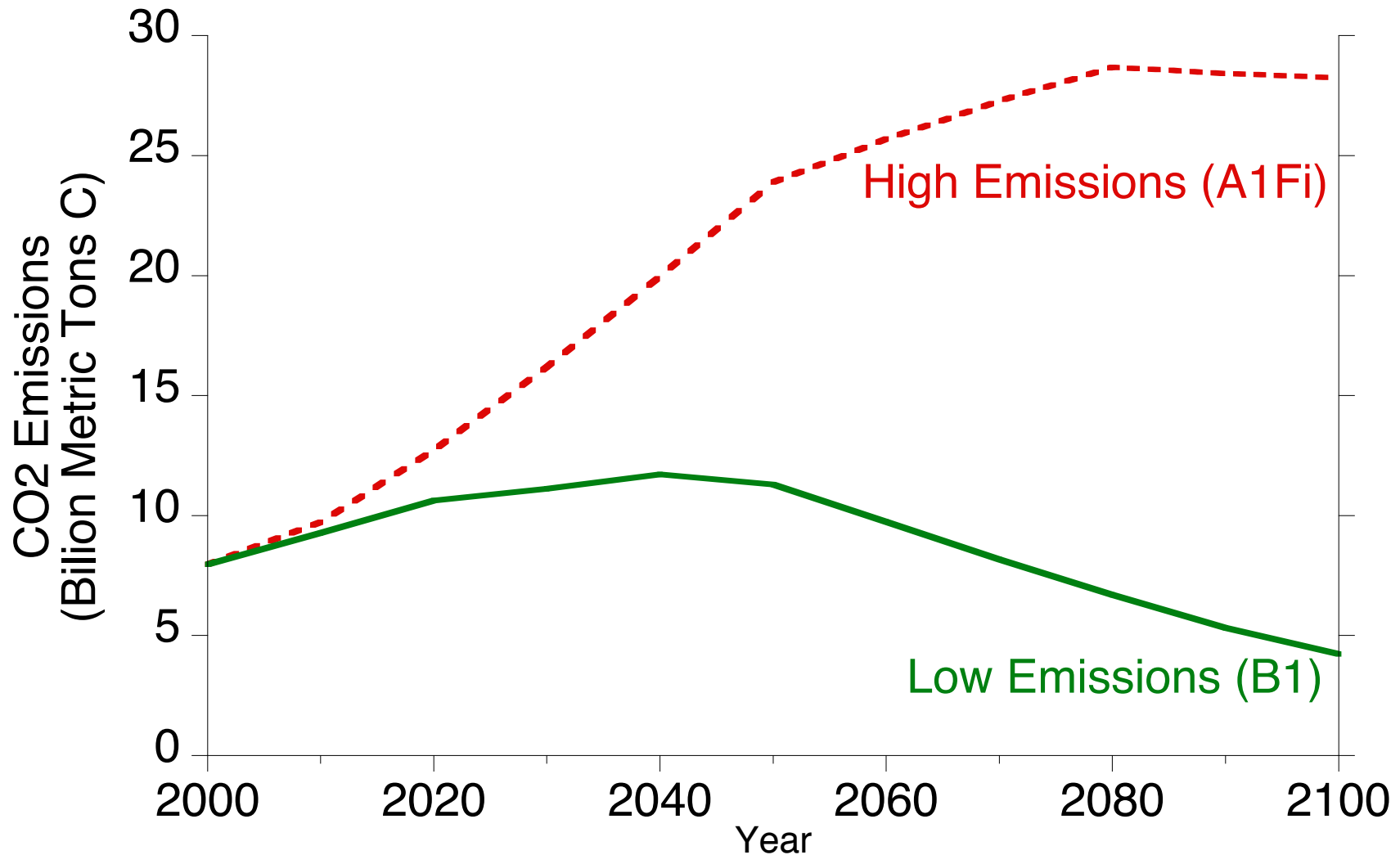


Sea Level Rise at Portsmouth Harbor 1927 - 2001



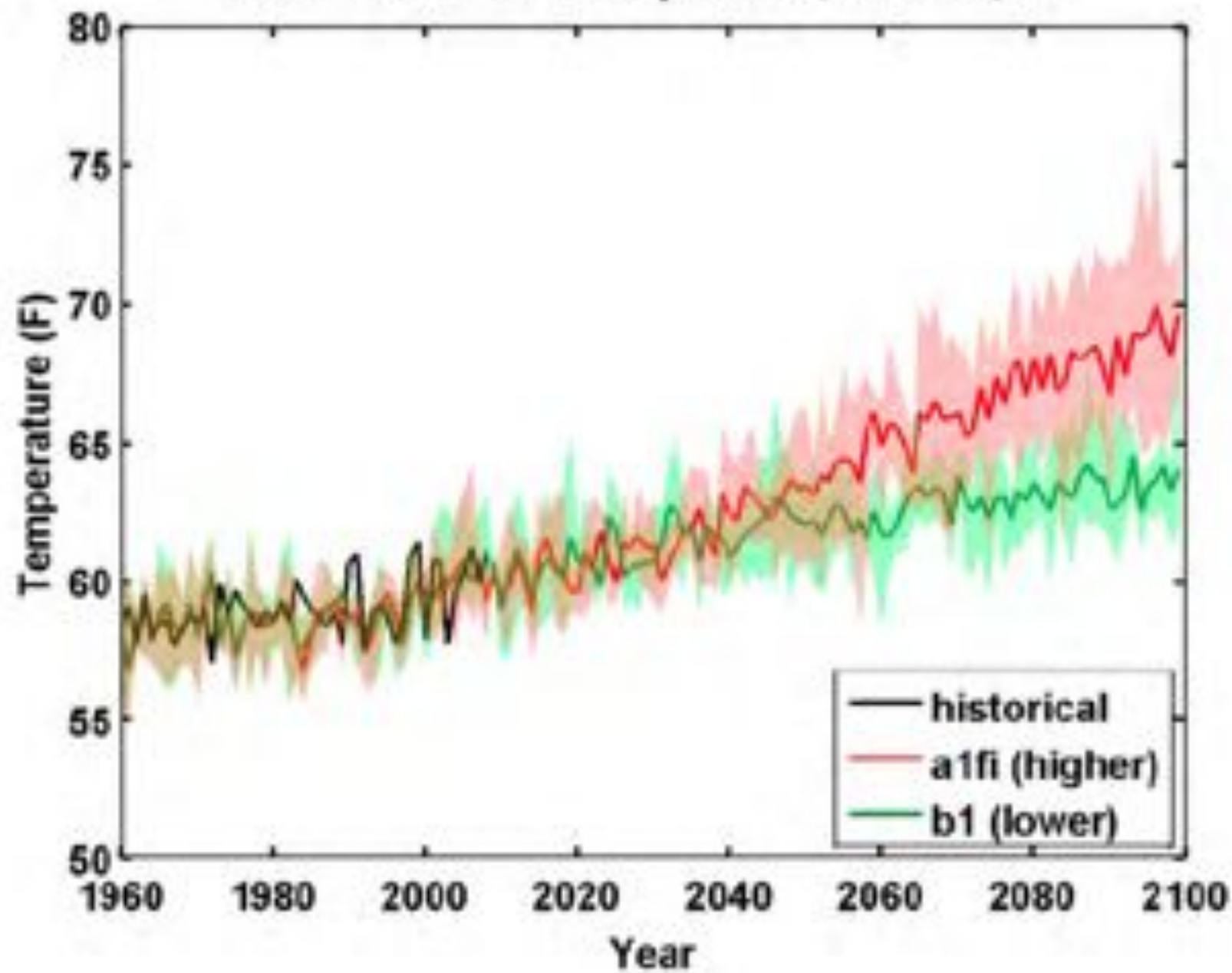
Global Greenhouse Gas Emission Scenarios

Key Input for GCM projections of future climate change

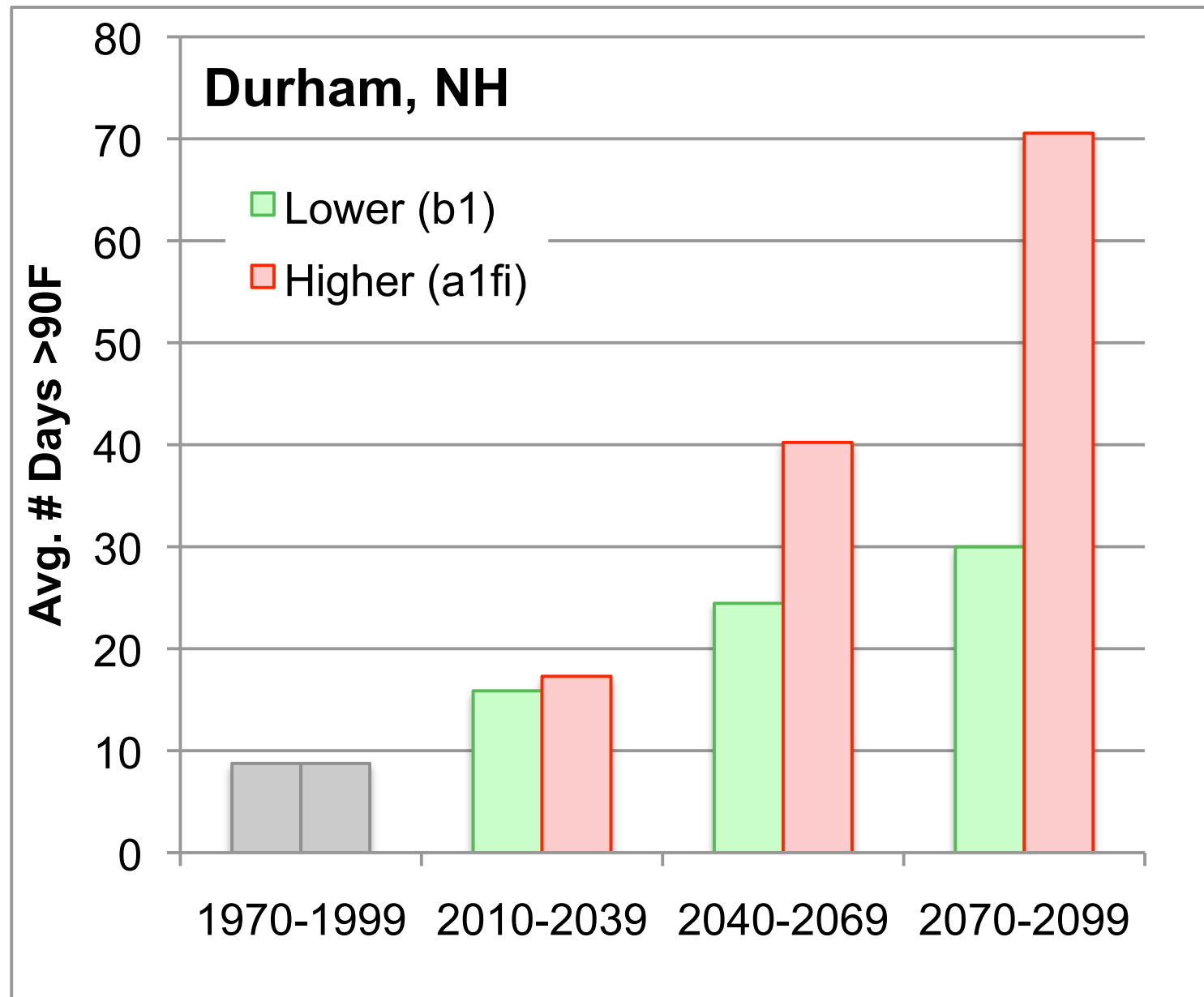


IPCC 2007

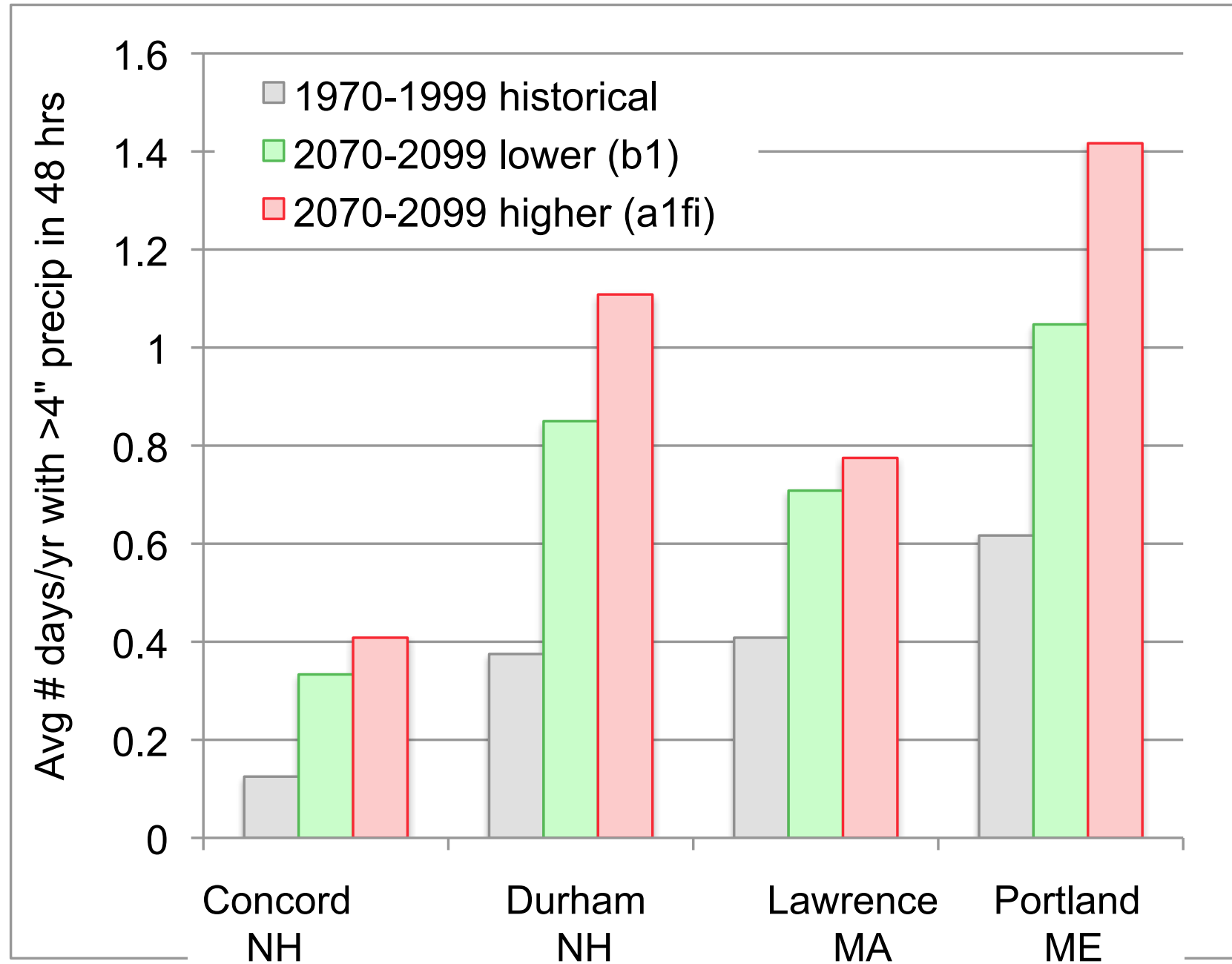
Annual Maximum Temperature, Durham, NH



How Hot Will Summer be in Durham, NH??



Projected Changes in Extreme Precipitation



Assessing Flood Risk in the Lamprey River Watershed, NH

**100-Year Floodplains in the Lamprey River Watershed:
Flood Insurance Rate Maps (FIRMs), Updated (2005) Conditions, and 2100 Conventional Buildout
Durham Panel**



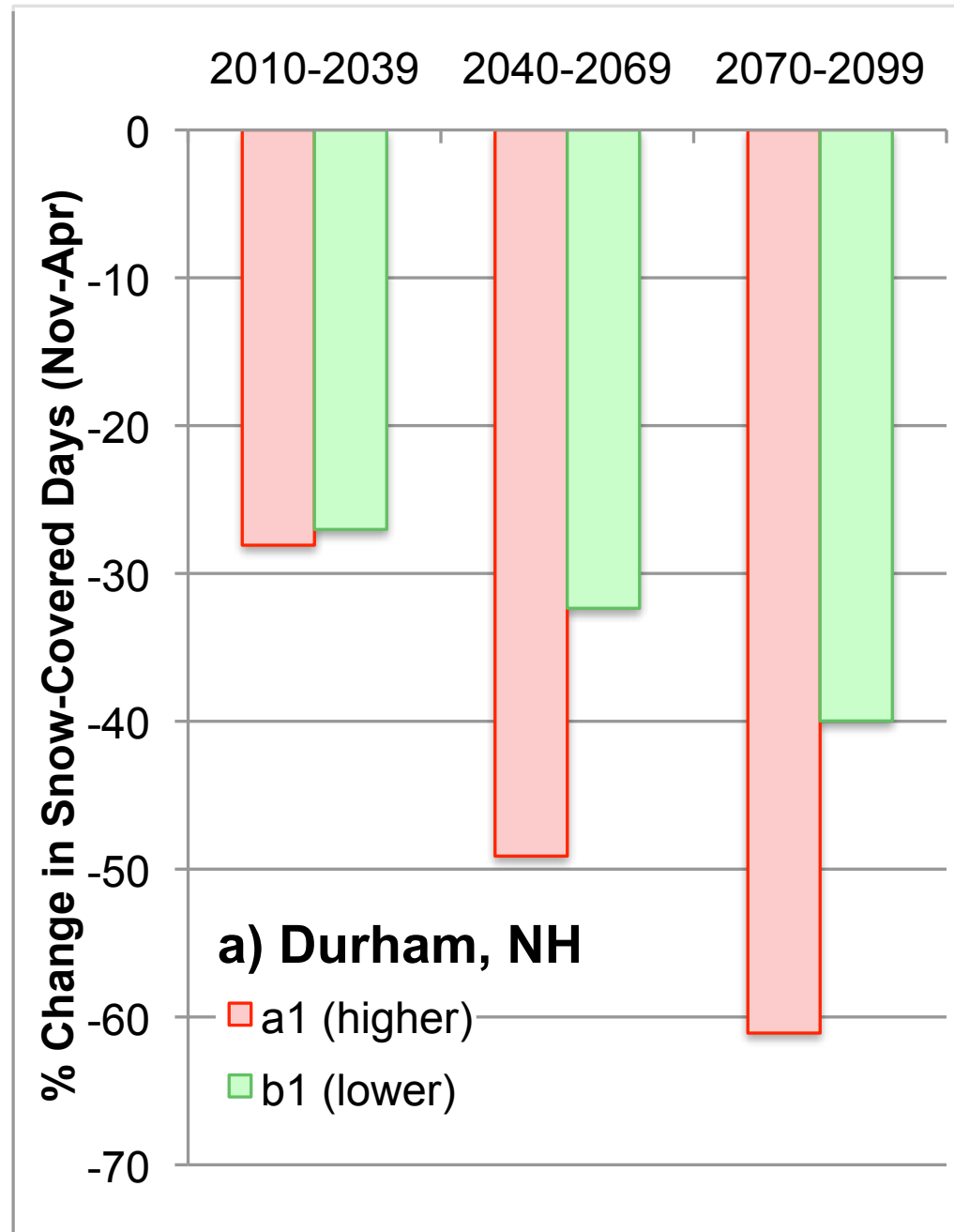
Flood Studies	100-yr Packers Falls Discharge	100-yr Packers Falls Water Surface Elevation	100-yr Floodplain Area
FIS to 2005	56%	2.7 ft	20%
2005 to 2100	66%	4.4 ft	14%



Newmarket, NH, April 2007, Patriots Day Storm <http://100yearfloods.org>

<http://100yearfloods.org>

Projected Changes in Snow Covered Days, Durham NH



Drought



1961-1990



0 5 10 15 20 25 30

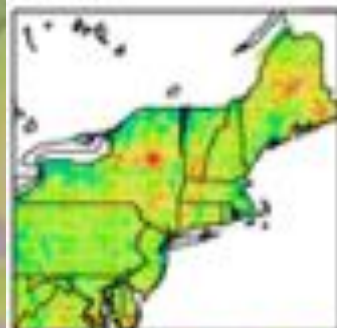


0 1 2 3 4 5

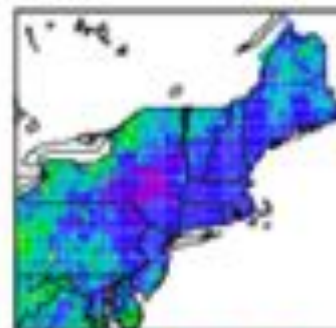


0 0.5 1 1.5 2

Lower Emissions (B1)



0 5 10 15 20 25 30

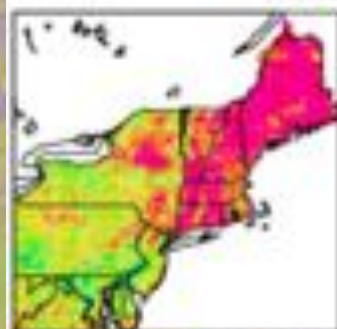


0 1 2 3 4 5

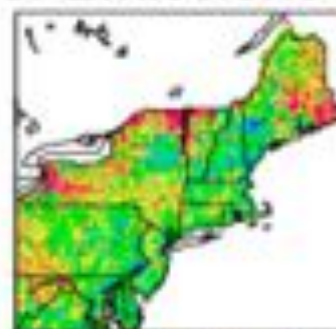


0 0.5 1 1.5 2

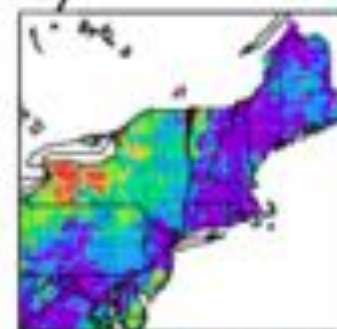
Higher Emissions (A1fi)



0 5 10 15 20 25 30



0 1 2 3 4 5



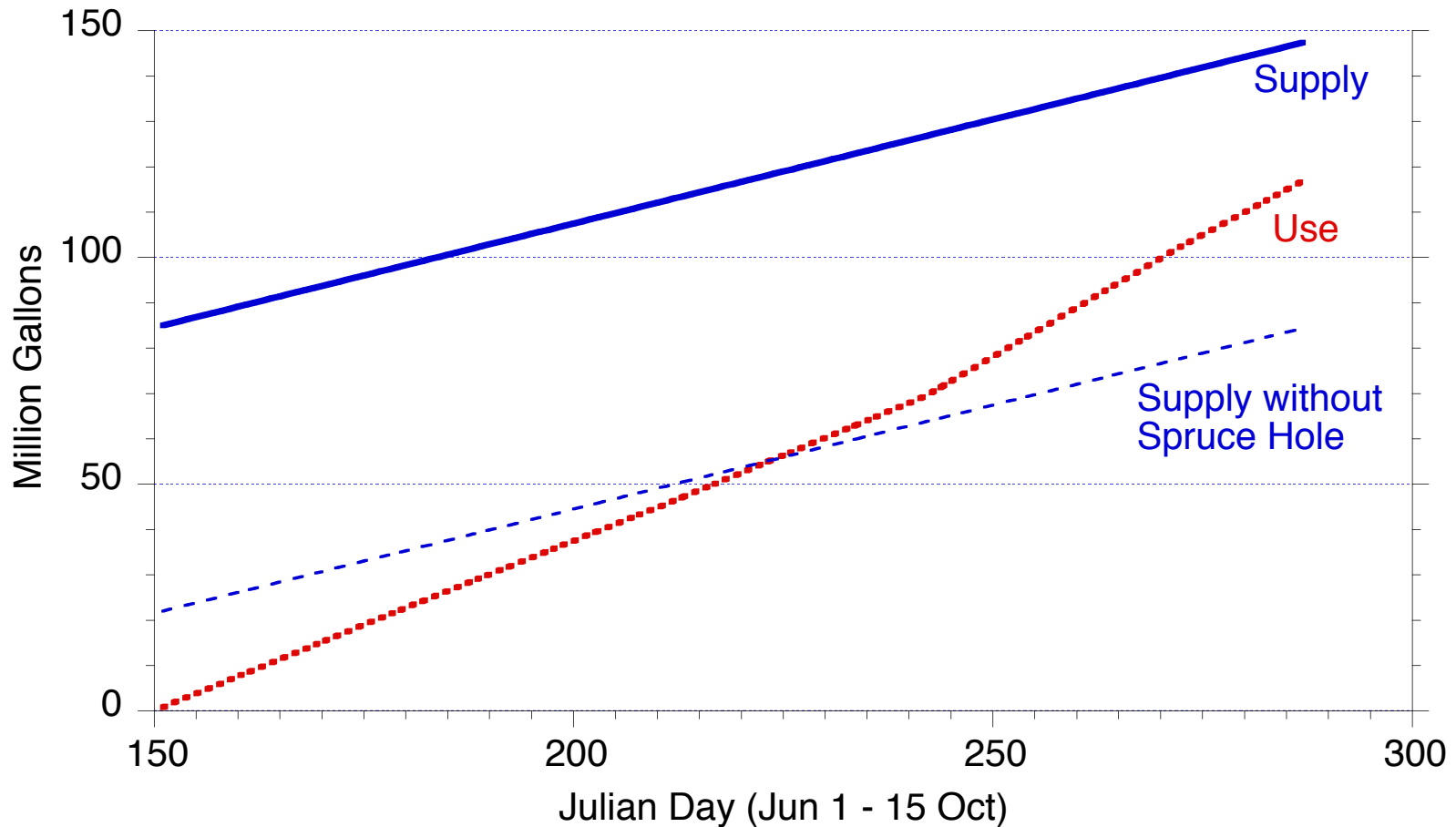
0 0.5 1 1.5 2

1-3 months

3-6 months

>6 months

**Estimated Daily Durham Water Supply and Use
(no additional water added to reservoirs after 1 Jun)**



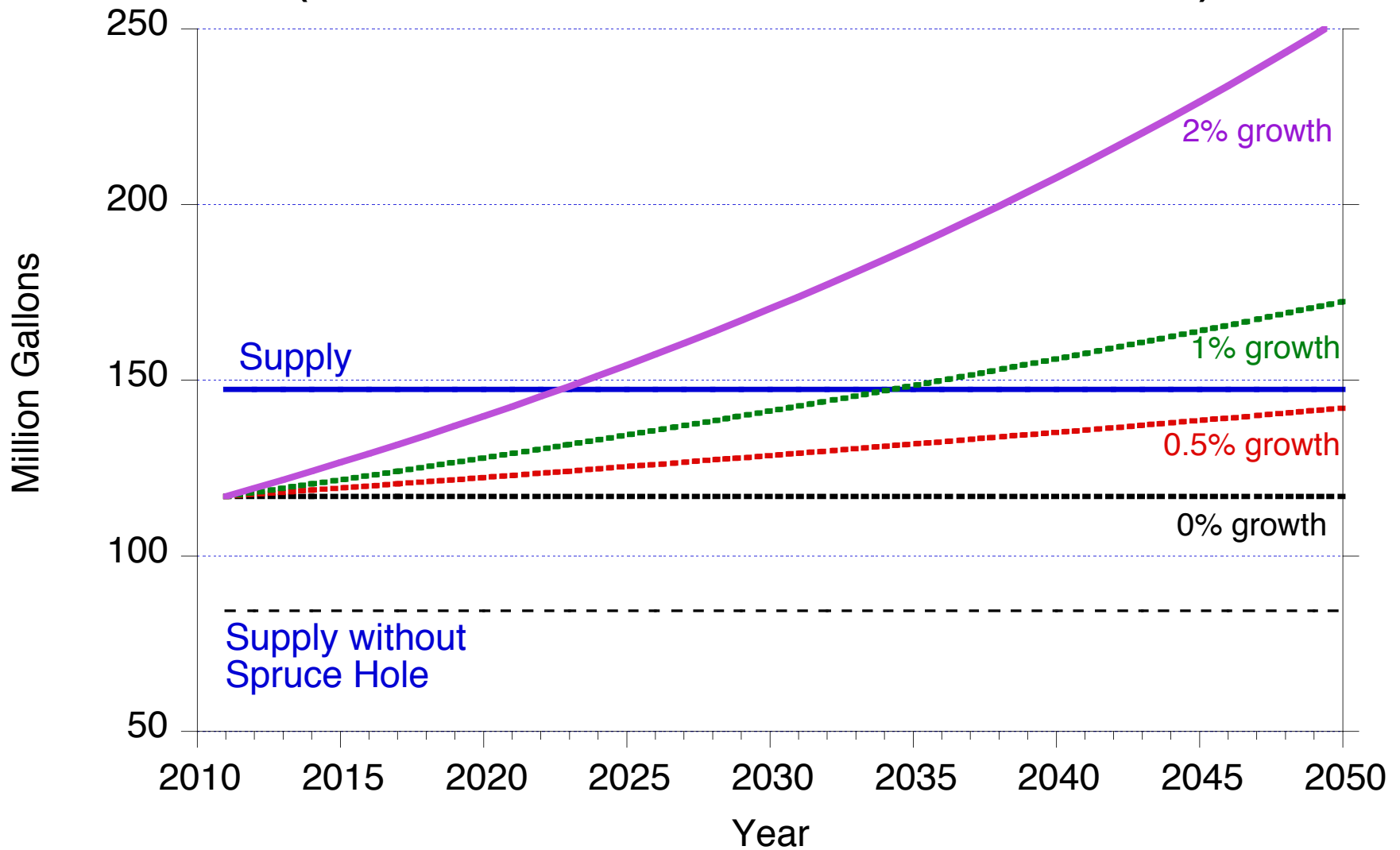
Supply based on: (1) Lee Well 459,000 gal/day

(1) Fixed reservoir amount as of 1 June (Oyster Riv 5 million gal; Wiswall 17 million gal)

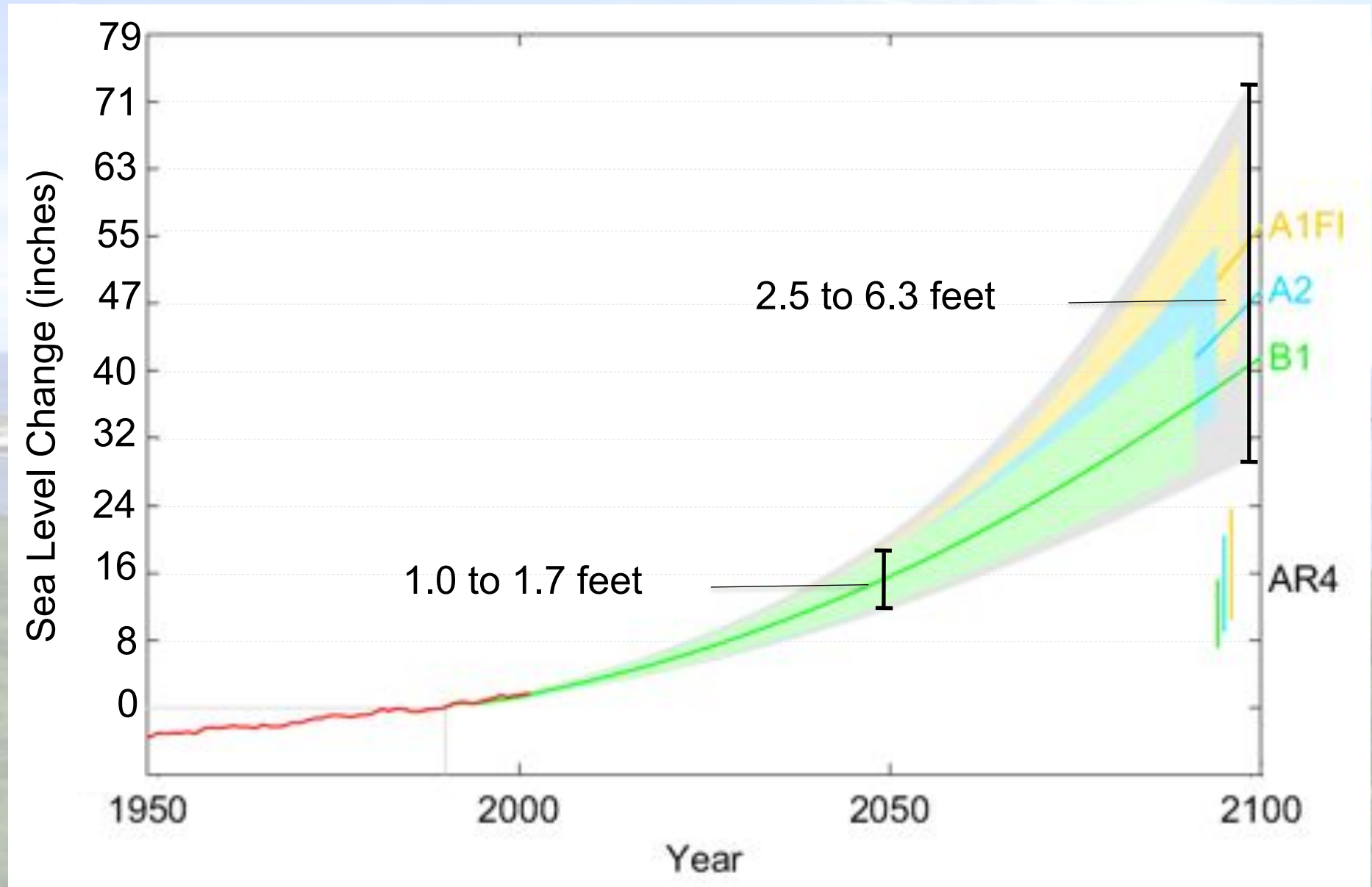
(2) Spruce Creek aquifer fixed amount as of 1 June (63 million gal)

Use estimated based on 2007-2011 water supply – 10% line loss, plus 1,257 additional beds

Projected Annual Durham Water Supply and Use (no additional water added to reservoirs after 1 Jun)

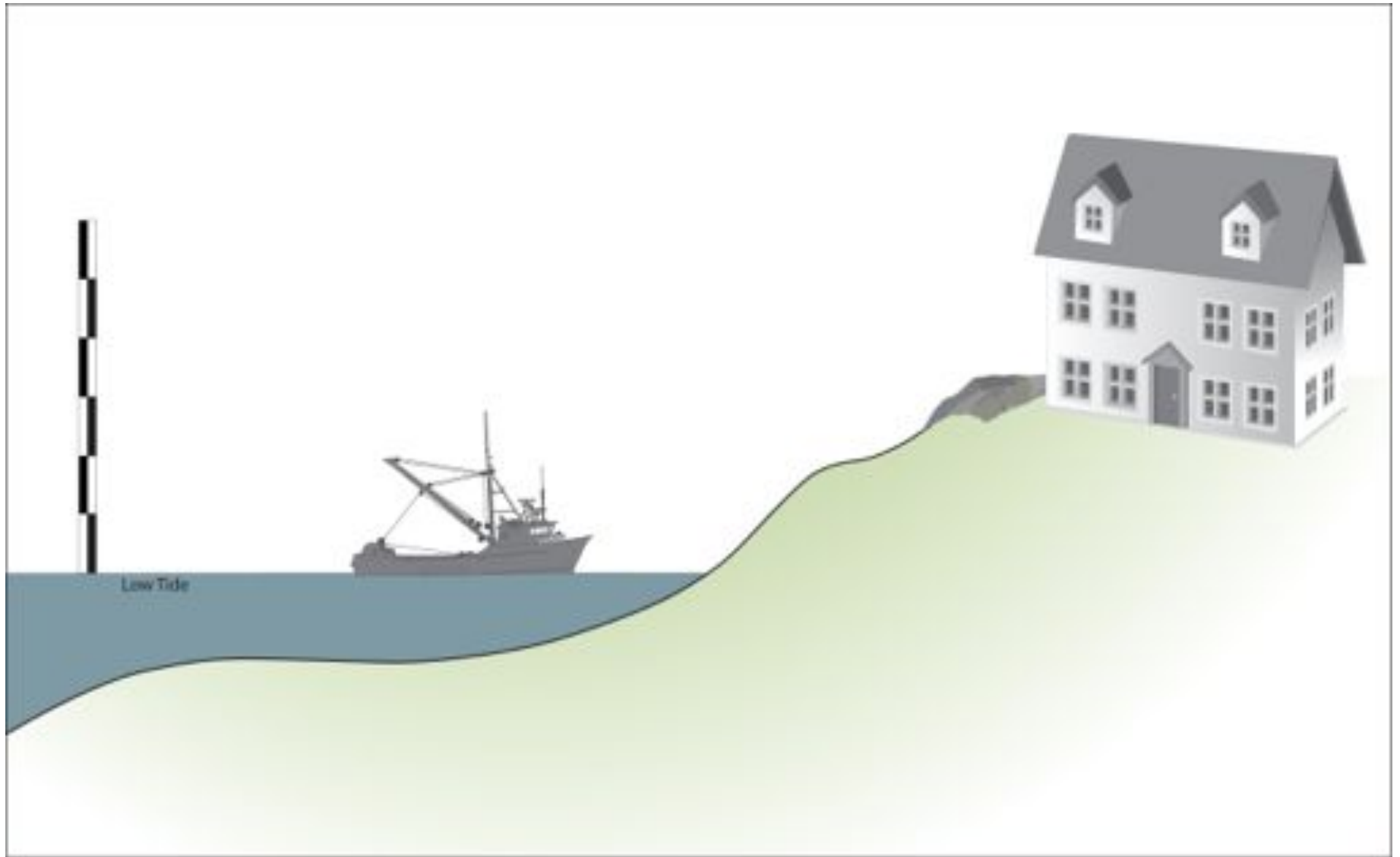


Projection of Sea Level Rise from 1990 to 2100

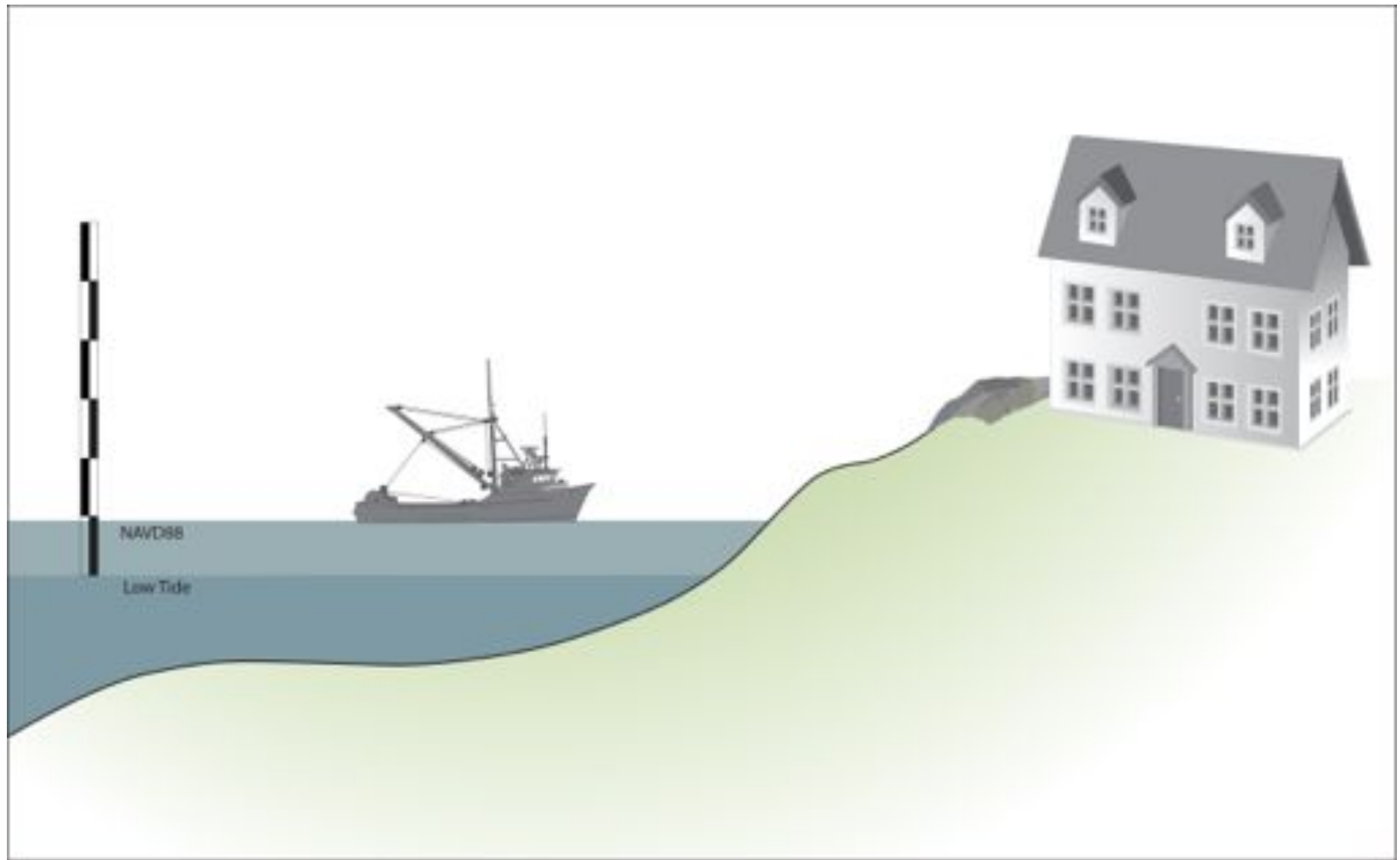


Vermeer and Rahmstorf 2009 PNAS

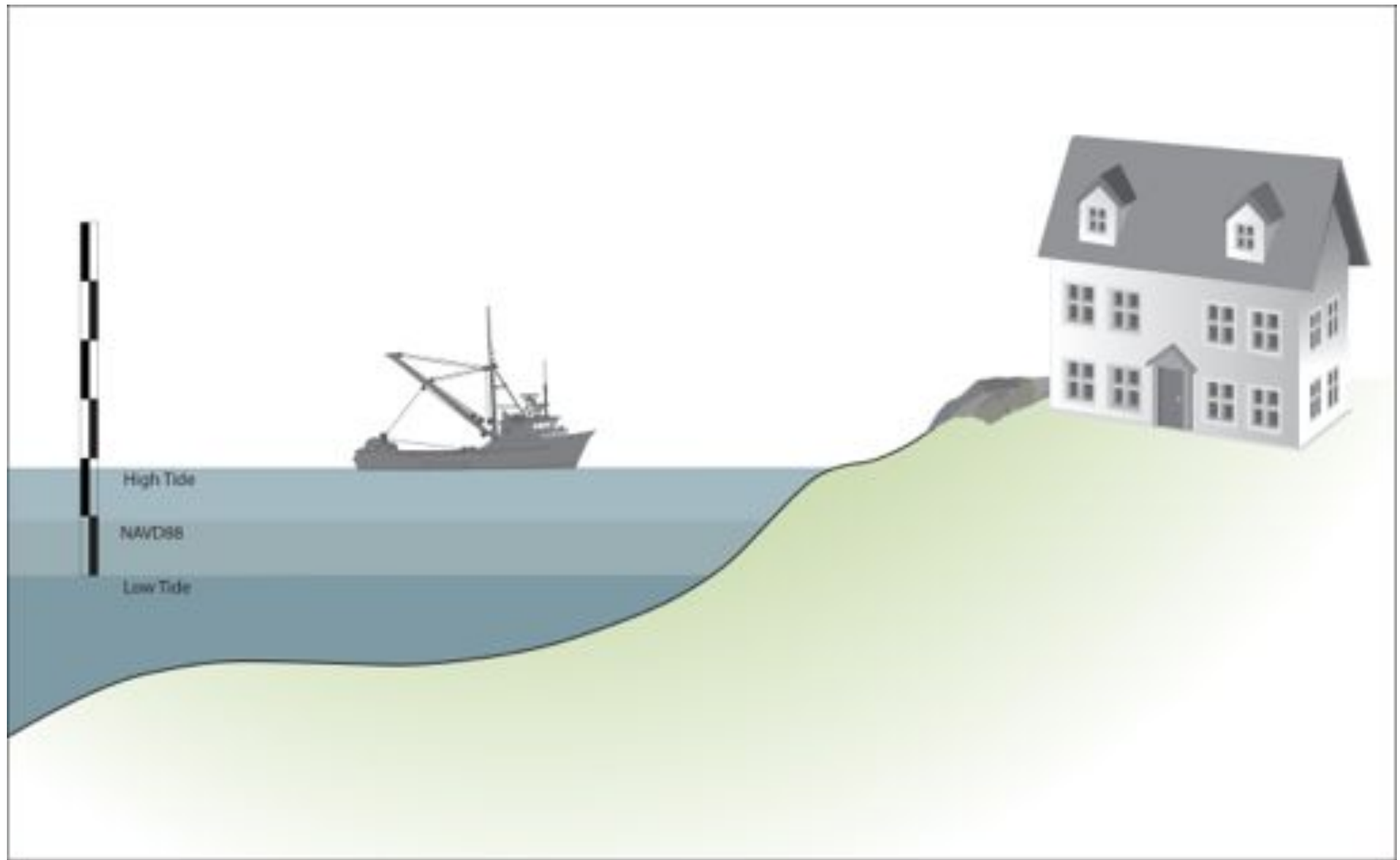
Stillwater Elevations for New Hampshire Seacoast



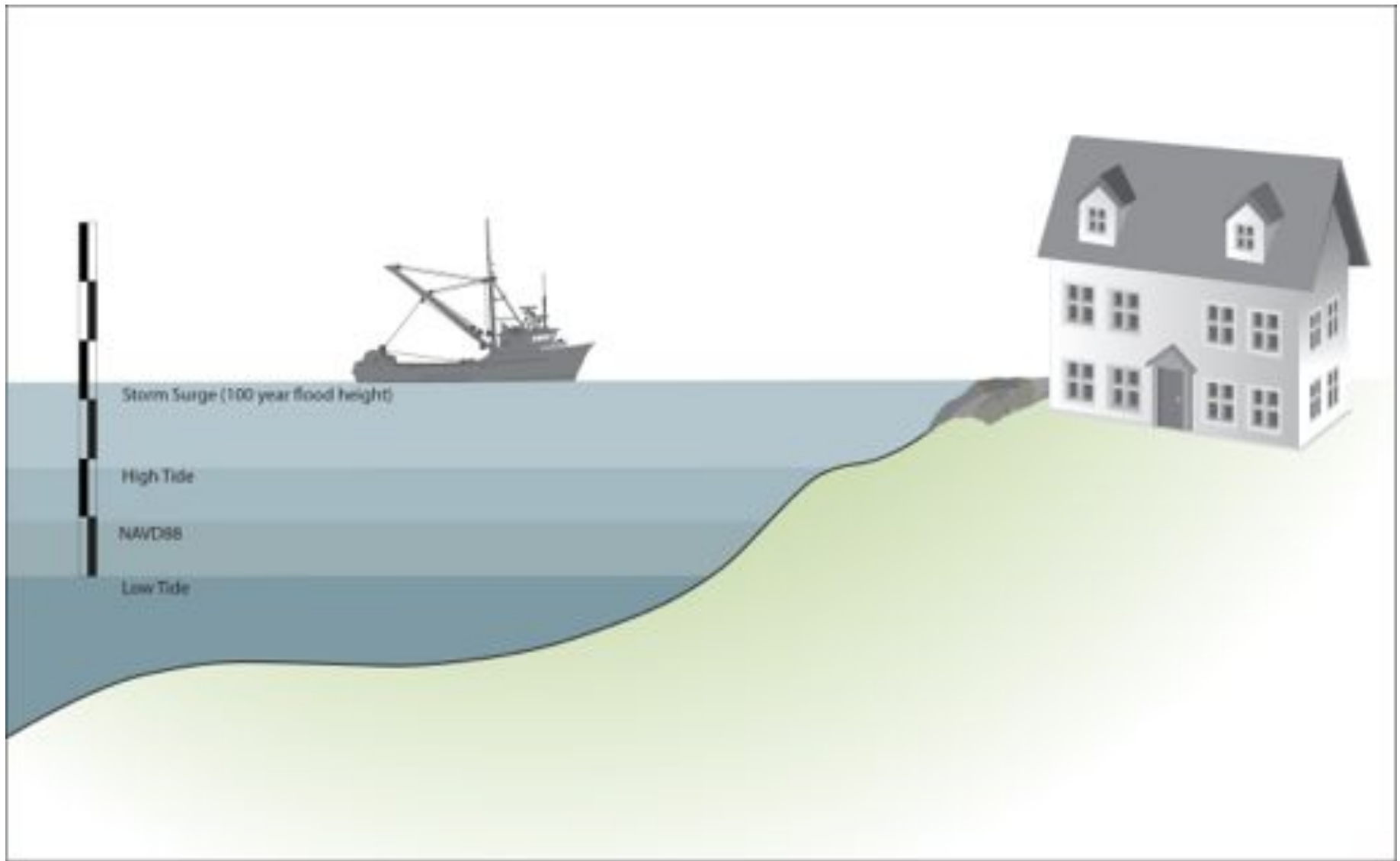
Stillwater Elevations for New Hampshire Seacoast



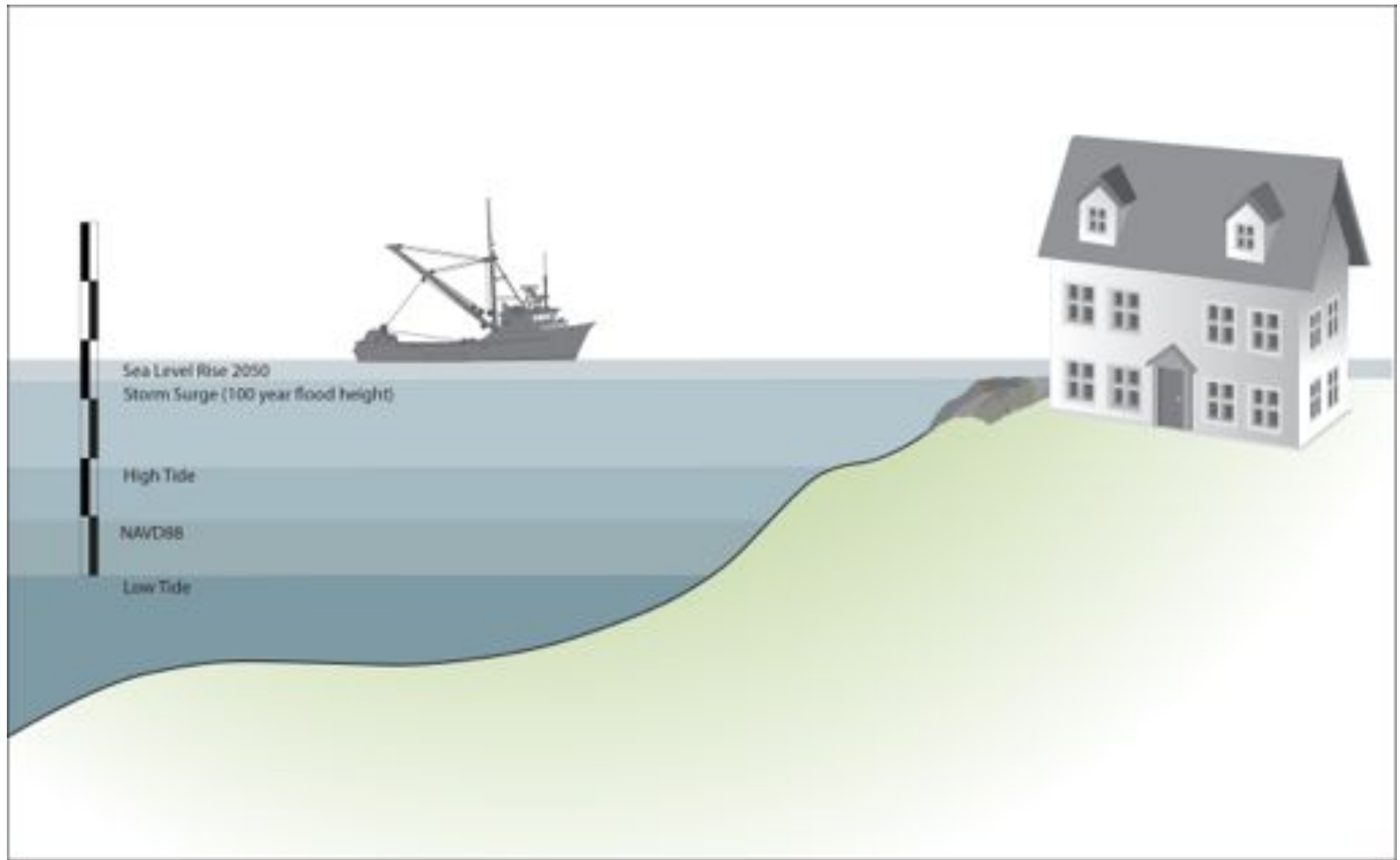
Stillwater Elevations for New Hampshire Seacoast



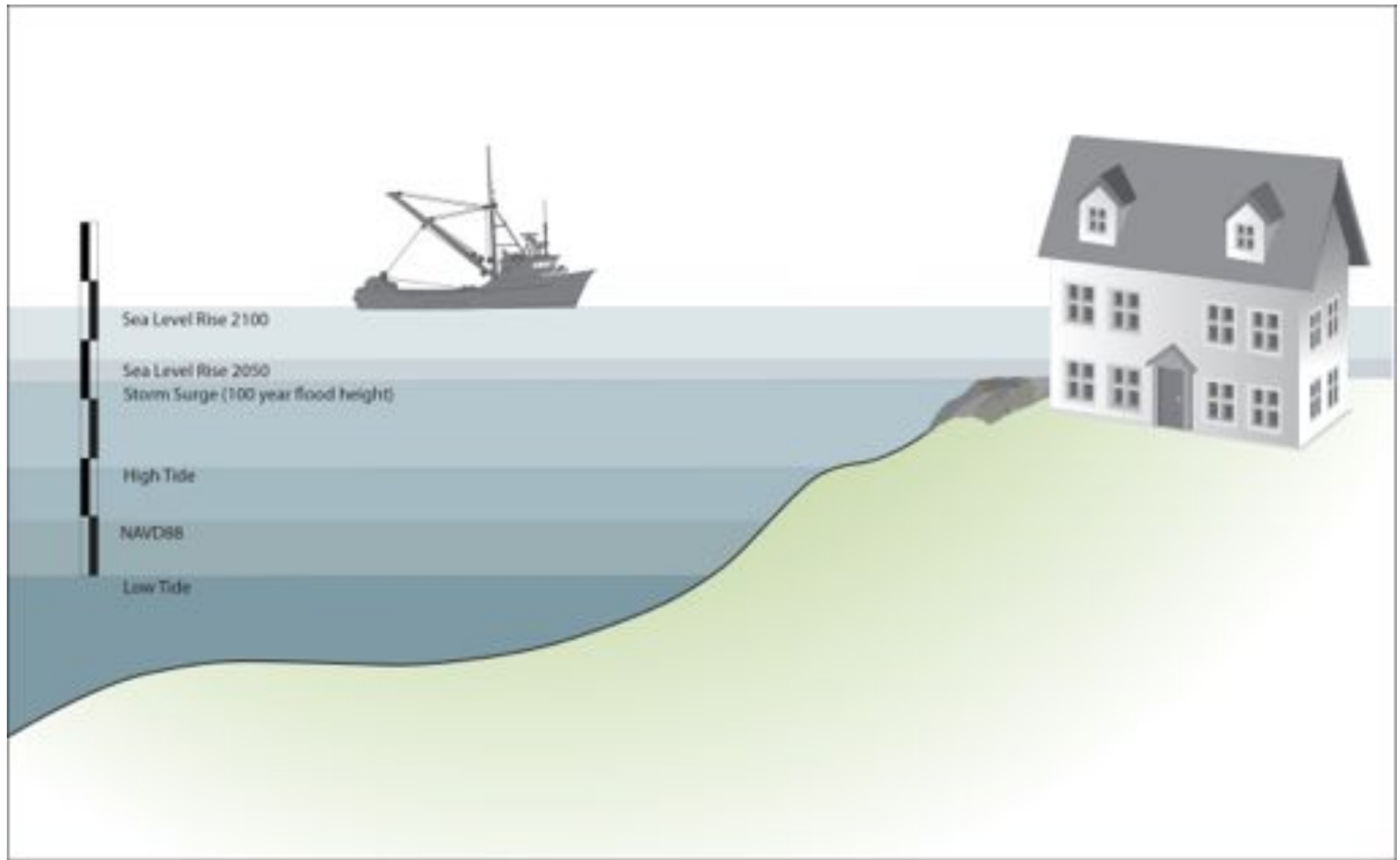
Stillwater Elevations for New Hampshire Seacoast



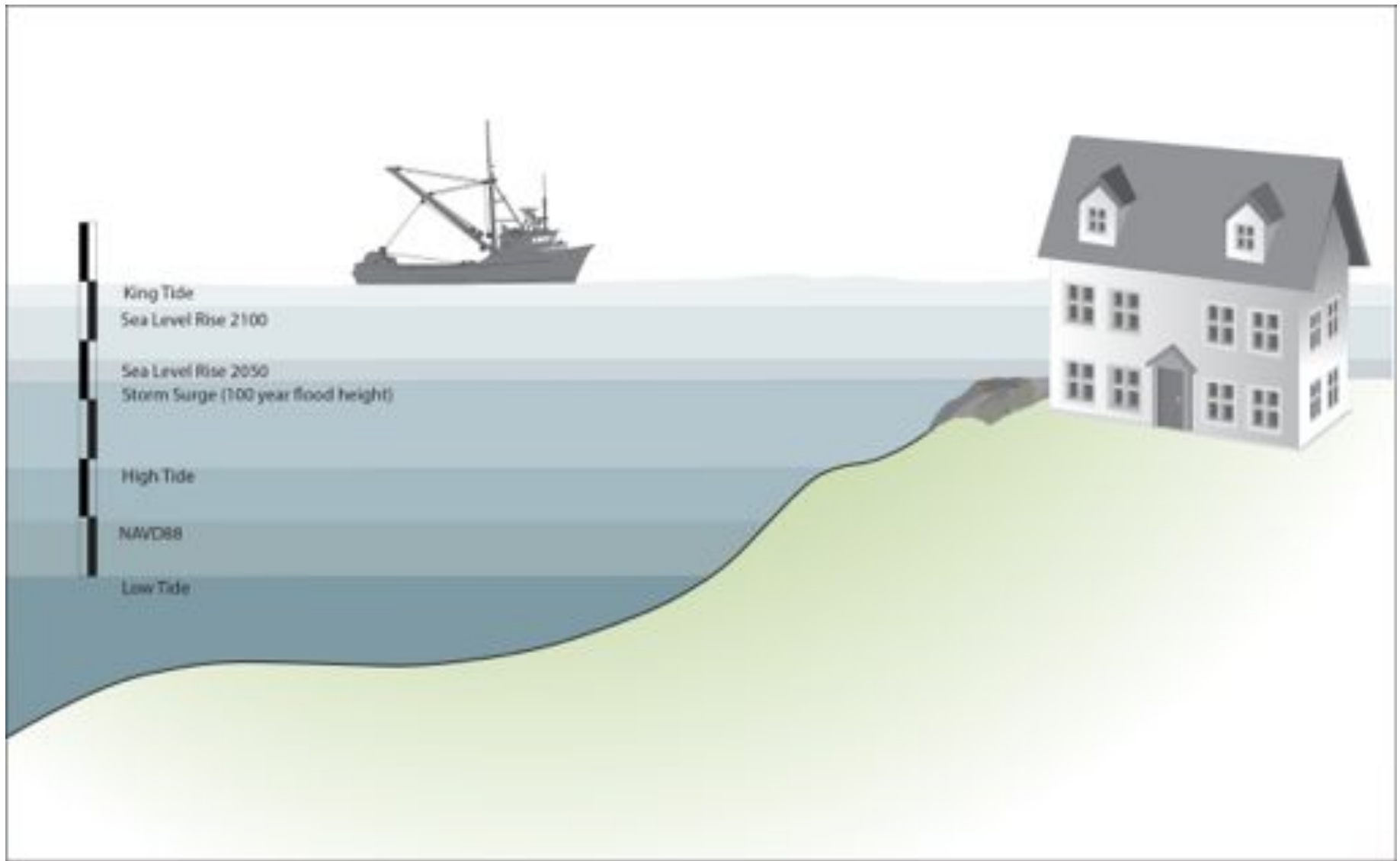
Stillwater Elevations for New Hampshire Seacoast



Stillwater Elevations for New Hampshire Seacoast



Stillwater Elevations for New Hampshire Seacoast



Stillwater Elevations for New Hampshire Seacoast

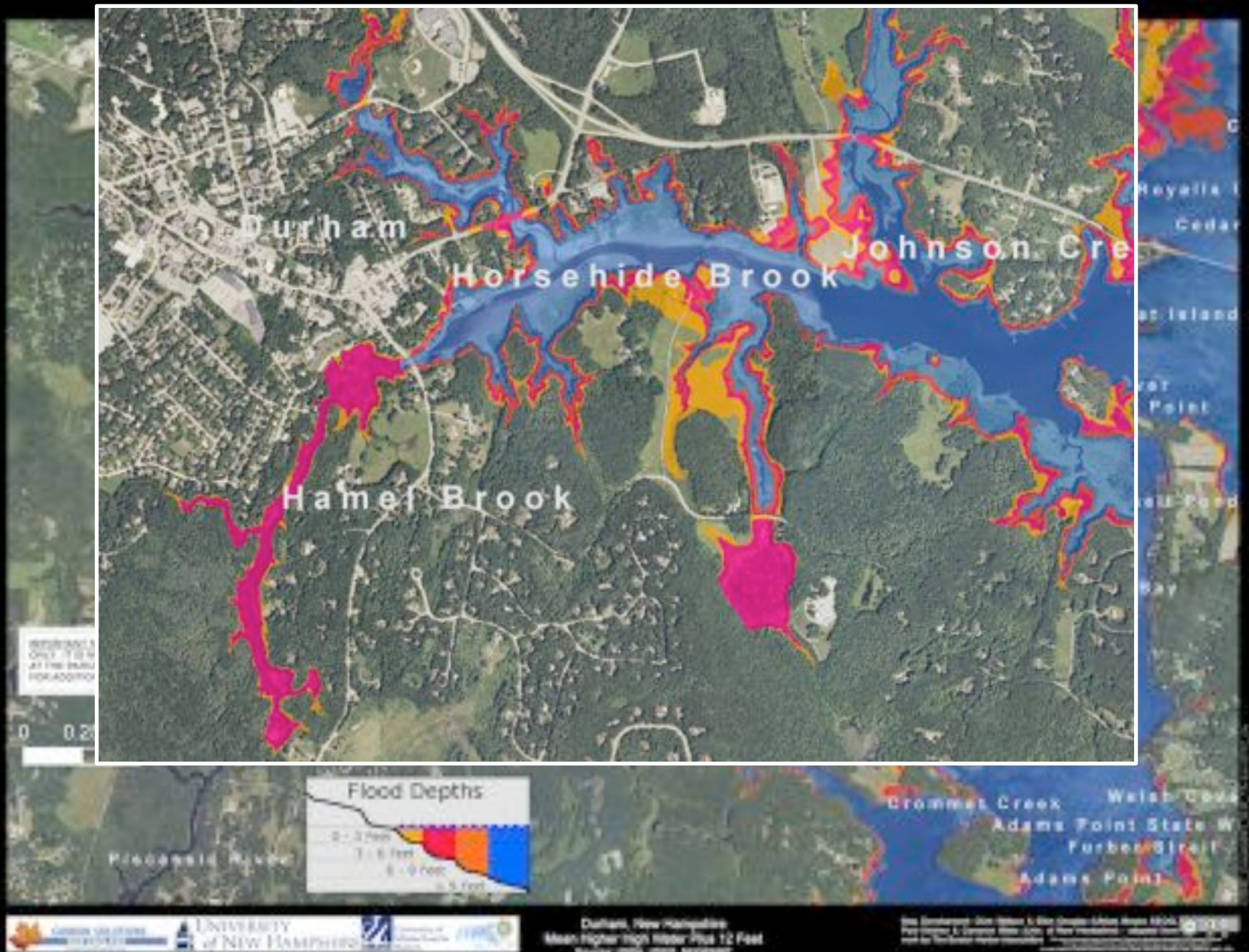
Range in 100-year flood elevations
(now to 2100)

11.2 to 19.7 feet above high tide

Future Stillwater Elevations at Newcastle, NH

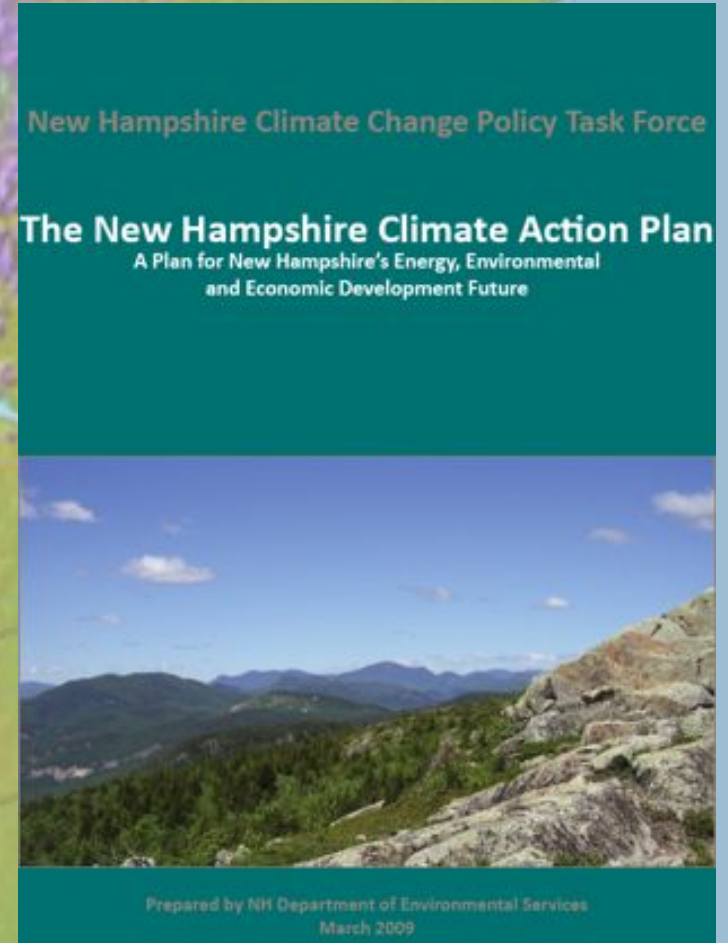
Event	LOWER SLR	HIGHER SLR
King Tide	15.9	19.7
SLR 2100	13.7	17.5
SLR 2050	12.2	12.9
100 yr flood	11.2	11.2
High Tide	4.4	4.4
NAVD88	0.0	0.0

High Tide + 12 feet - Durham, NH



NH Climate Action Plan

- One of the largest, most diverse collections of leading NH citizens
- Promotes growth of new jobs and renewable energy development
- Reduces energy costs
- Identifies 67 recommended actions
 - buildings
 - electricity generation,
 - transportation & land use
 - natural resources
 - government action
 - adaptation
- Reduce greenhouse gas emissions
 - 44% below 2005 levels by 2025
 - 86% below 2005 levels by 2050



More info at:
<http://CarbonSolutionsNE.org>

How Can You Use This Information?

1. Climate Assessment is first step in Vulnerability Assessment
 - evaluation of vulnerability of communities to changing climate
 - qualitative (NOAA Roadmap) & quantitative (technical, analytical)
 - Coastal Adaptation Workgroup members can provide support and technical assistance
2. Integrate into planning
 - Master Plan
 - Hazard Mitigation Plan
 - Emergency Operations Plan
 - Capital Improvement Plan
 - Business Plan
 - Home construction and renovation

Municipal Climate Change Planning Framework

- Community Outreach and Support
- Coordination and Technical Assistance
- Action and Implementation

Elected Officials

- Municipal Policies and Investments
- Budget and Capital Improvement Plan
- Hazard Mitigation Plan (approval w/ EMD and providers)

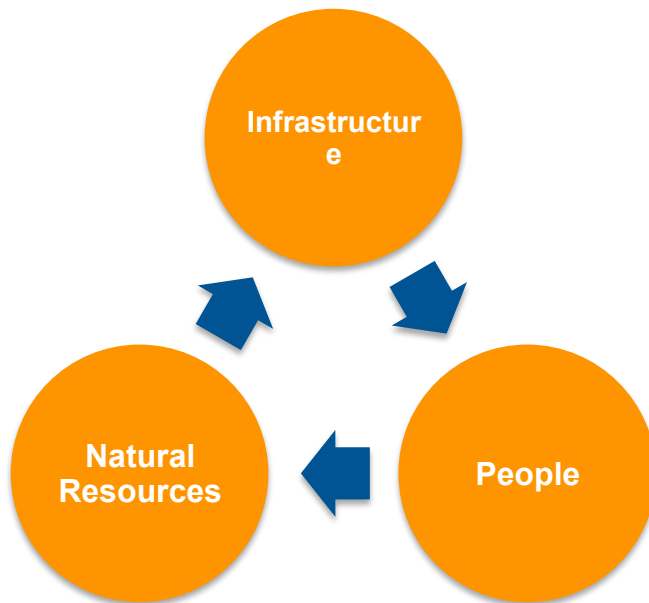
Planning Board

- Master Plan – comprehensive framework and guidance
- Zoning and Regulations – performance criteria to meet goals
- Natural Resources – protect services and values

Newfields: A World Café Vulnerability Assessment

Community members explored two questions:

1. How could _____ (*people, infrastructure, or natural resources*) be impacted by more flooding, extreme heat, and more frequent or intense storms?
2. What actions can be taken to address these impacts?



Natural Hazard maps and Aerial Photo maps were provided to each table.

Report Outs & Prioritizing Focus Areas

Two focus areas: Stormwater Management & Emergency Preparedness



Action Planning

SAMPLE

Focus Area #1: Stormwater Management

Actions	People	Costs	Timeframe	Notes
<i>Outcome #1: A web-based map of stormwater infrastructure that is easy to access and update.</i>				
1. Inventory the <i>location, capacity, and condition</i> of stormwater infrastructure. • Contact UNH Civil Engineering Department about student volunteer project • Look into NH Coastal Program funding, New England Grassroots Environment Fund, and others	Planning board PB Chair Coastal Adaptation Workgroup	None to low	Spring 2013	There are several options for obtaining this information: (a) Incorporate as a CIP action, (b) pursue through volunteer collection, (c) Hire a contractor
...	...	...	...	...

Interested in this method?

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