

Climate Change in Winthrop

Daniel Brown

Climate Change Program Coordinator

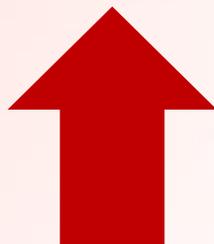
dbrown@massaudubon.org



Mass Audubon

Key changes already observed in Massachusetts.

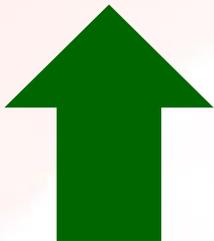
Temperature:



2.9°F

Since 1895

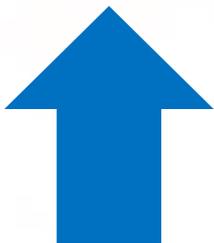
Growing Season:



11 Days

Since 1950

Sea Level Rise:



11 inches

Since 1922

Strong Storms:

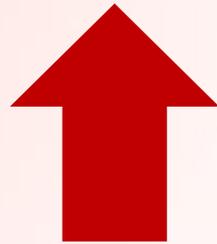


55%

Since 1958

Suffolk County Projected Changes (2040-2069)

Annual Average
Temperature



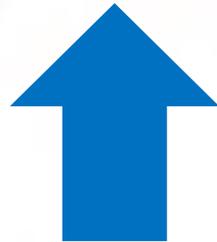
4.9°F

Days Above 90°F



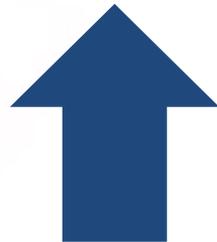
19 Days

Sea Level Rise



2.4 feet

Days with >2"
Precipitation



44%

What's in a degree?

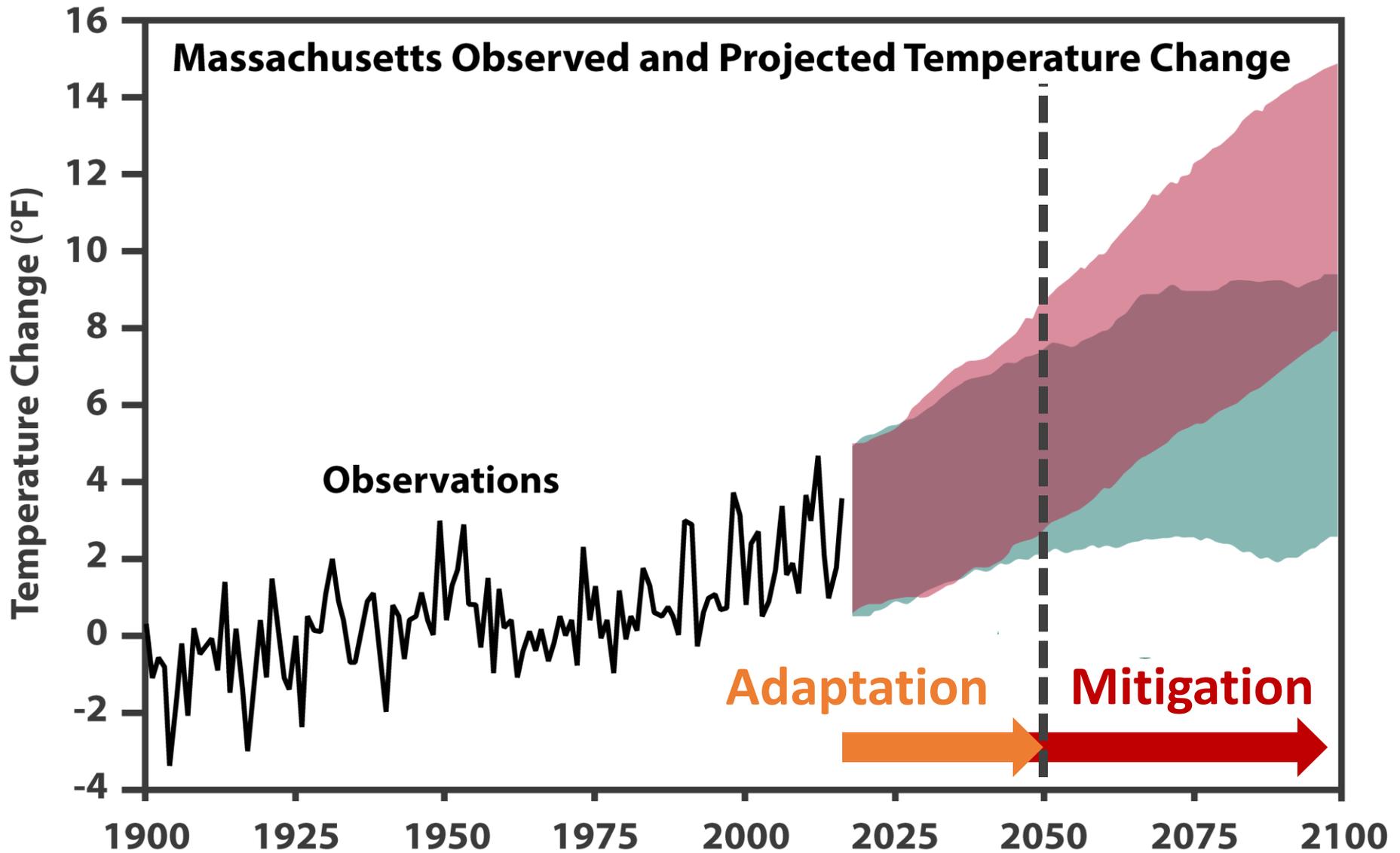


During the last ice age, temperatures were 9°F cooler than today.

lat: 50.947367, lon: -115.119534, alt: 161 m

Google

Eye alt: 8640.83 km



Source: NCICS State Climate Summaries. Observational data from NOAA nClimDiv dataset. Accessed 2017.

Annual Average Temperature

Suffolk County, MA

Observed

°F

Temperature °F

5-yr Mean



Modeled °F

Max



Median

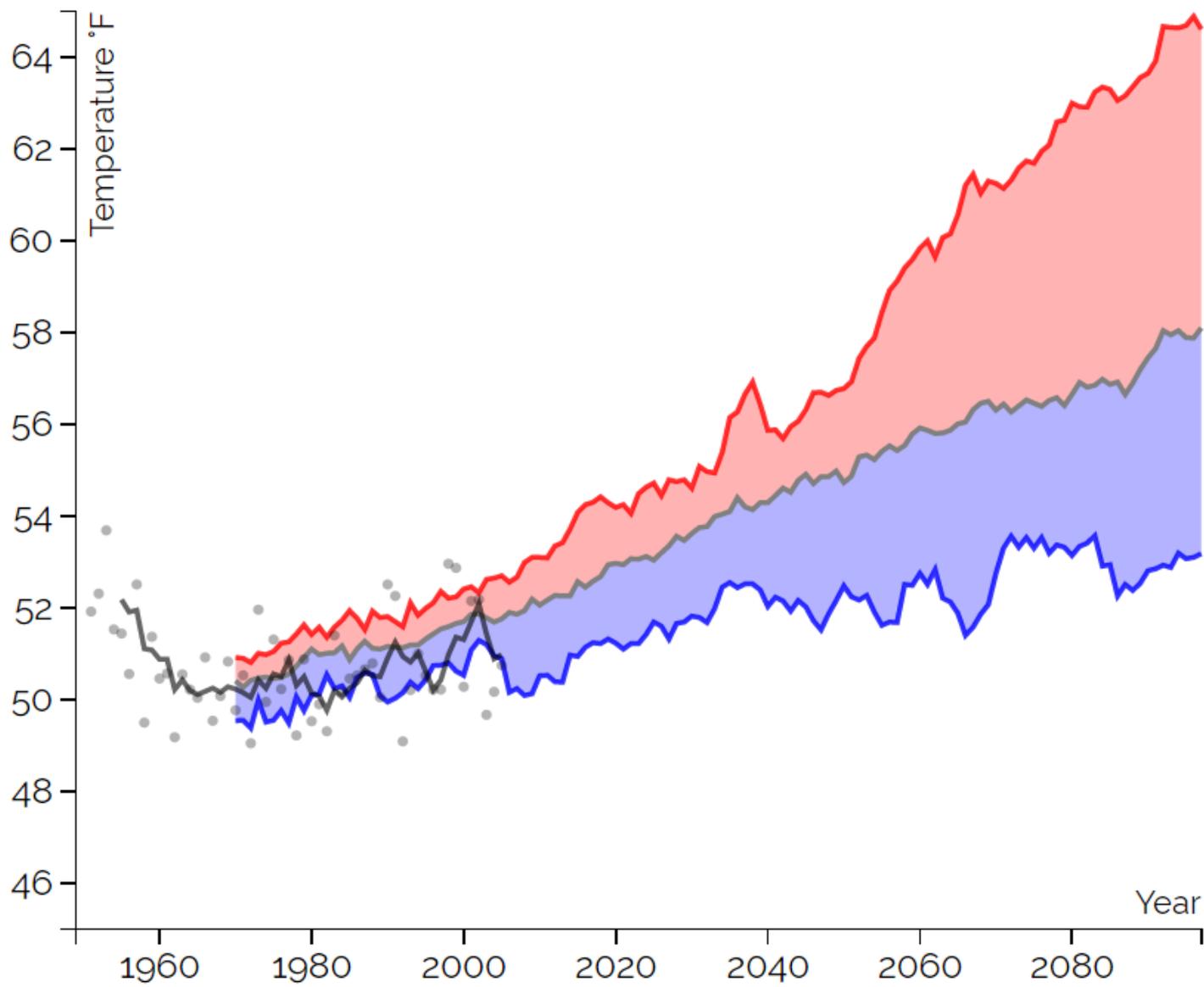


Min



Changes from
1971-2000 for:

2020 -	3.58°F
2049	
2040 -	4.88°F
2069	
2060 -	5.97°F
2089	
2080 -	6.60°F
2097	

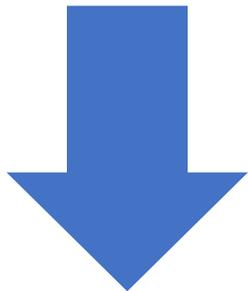


Source: Northeast Climate Science Center, MassClimateChange.org, accessed 2018.

Changing Energy Use and Demand

More Warm Winter Days, Less Heating Demand

(based on annual Heating Degree-Days, base 65)



11 – 24%

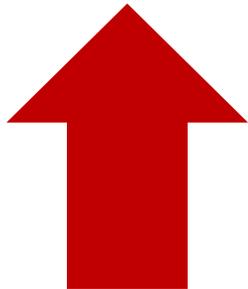
by the 2050s

1971-2000

6079 Heating Degree-days

More Warm Summer Days, More Cooling Demand

(based on annual Cooling Degree-Days, base 65)



44 – 120%

by the 2050s

1971-2000

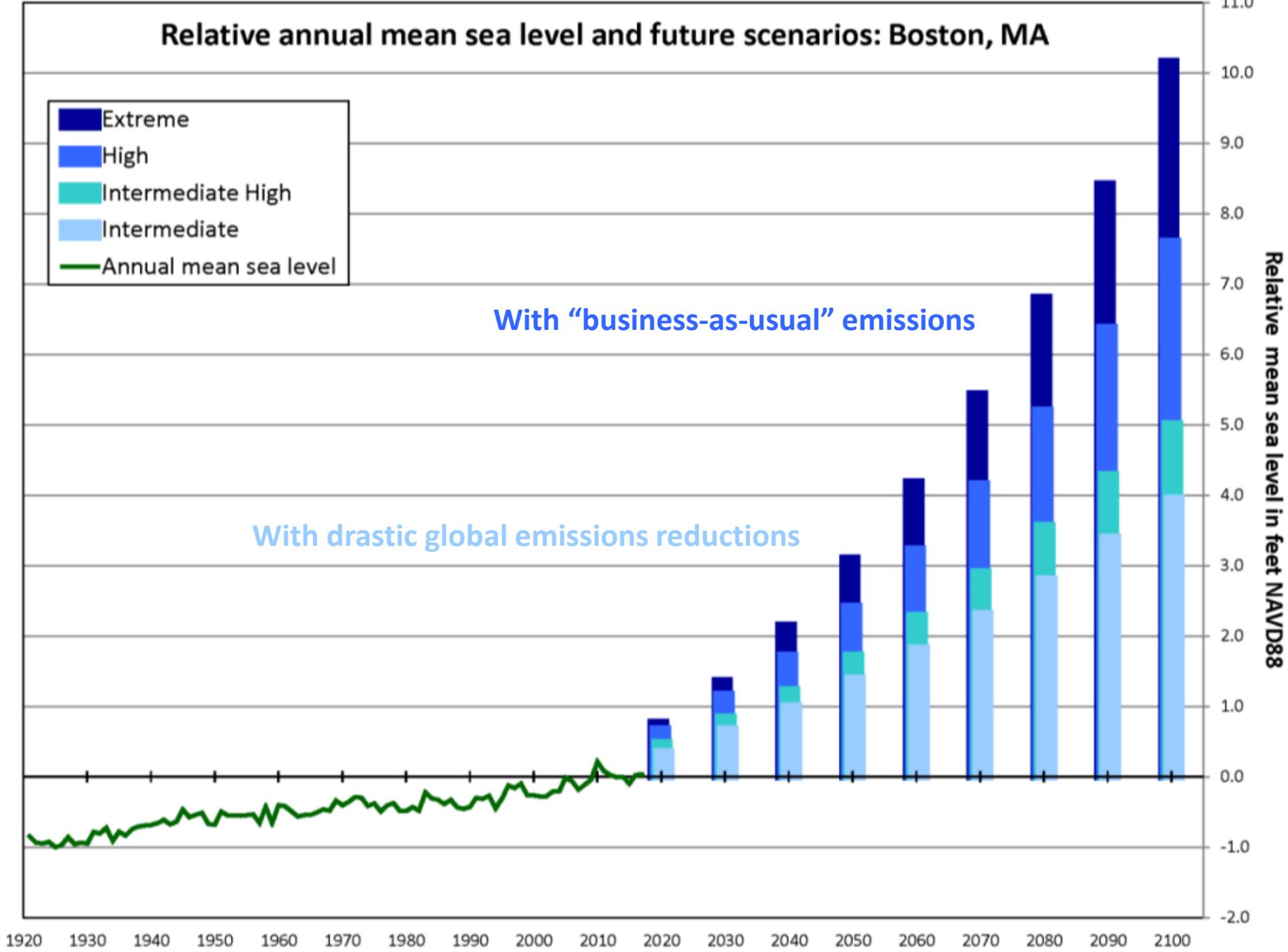
636 Cooling Degree-days

Relative annual mean sea level and future scenarios: Boston, MA

- Extreme
- High
- Intermediate High
- Intermediate
- Annual mean sea level

With "business-as-usual" emissions

With drastic global emissions reductions





3' SLR

Boston Harbor



Middlesex
Suffolk

Chelsea

Suffolk Downs

Belle Isle
Marsh
Reservation

Belle
Isle Inlet

Winthrop

Winthrop
Golf Club

Yirell
Beach

Deer Island

Deer Island

Massport-Marine
Terminal

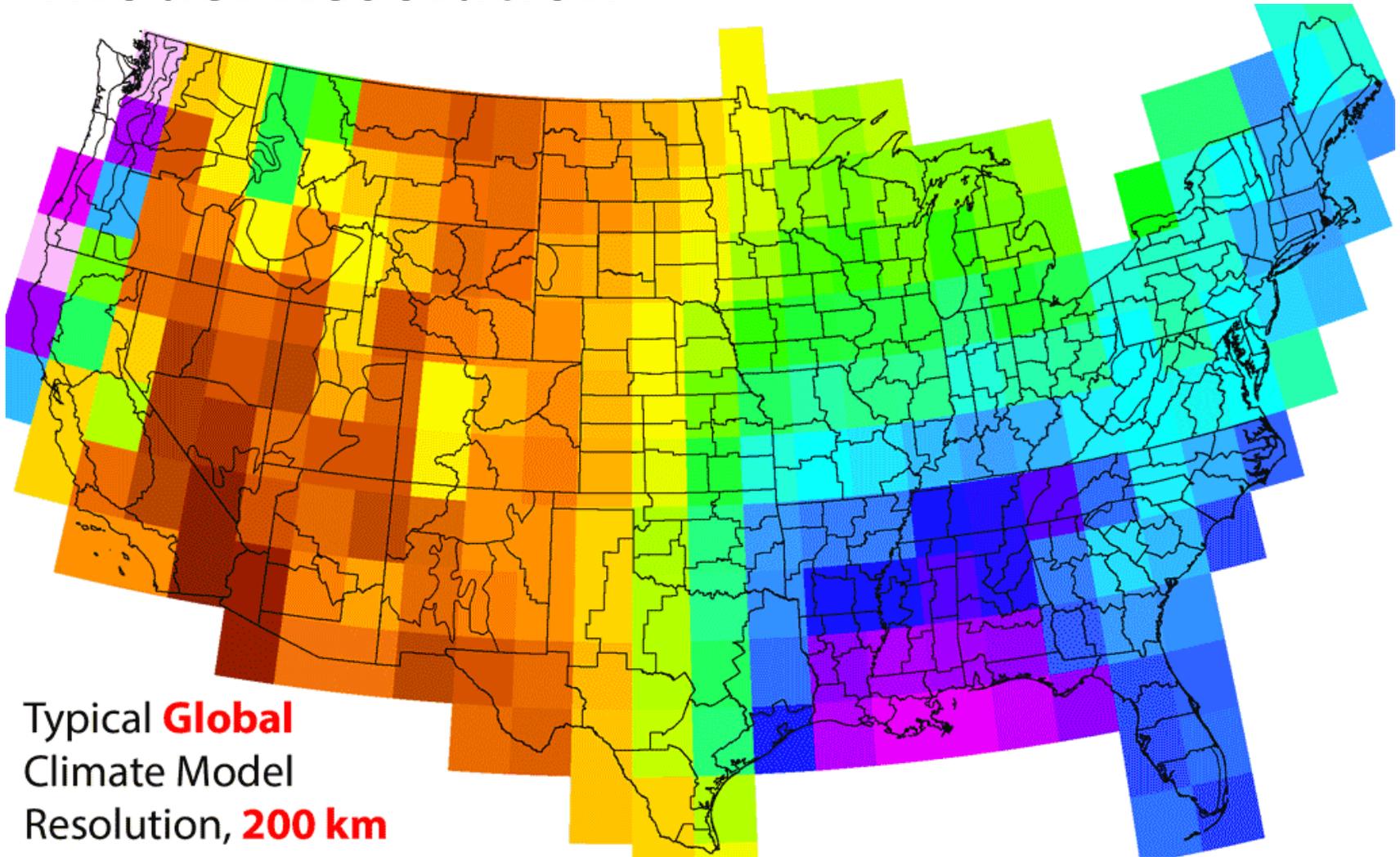
Economic Dev
Industrial Corporation

Boston Harbor

6' SLR

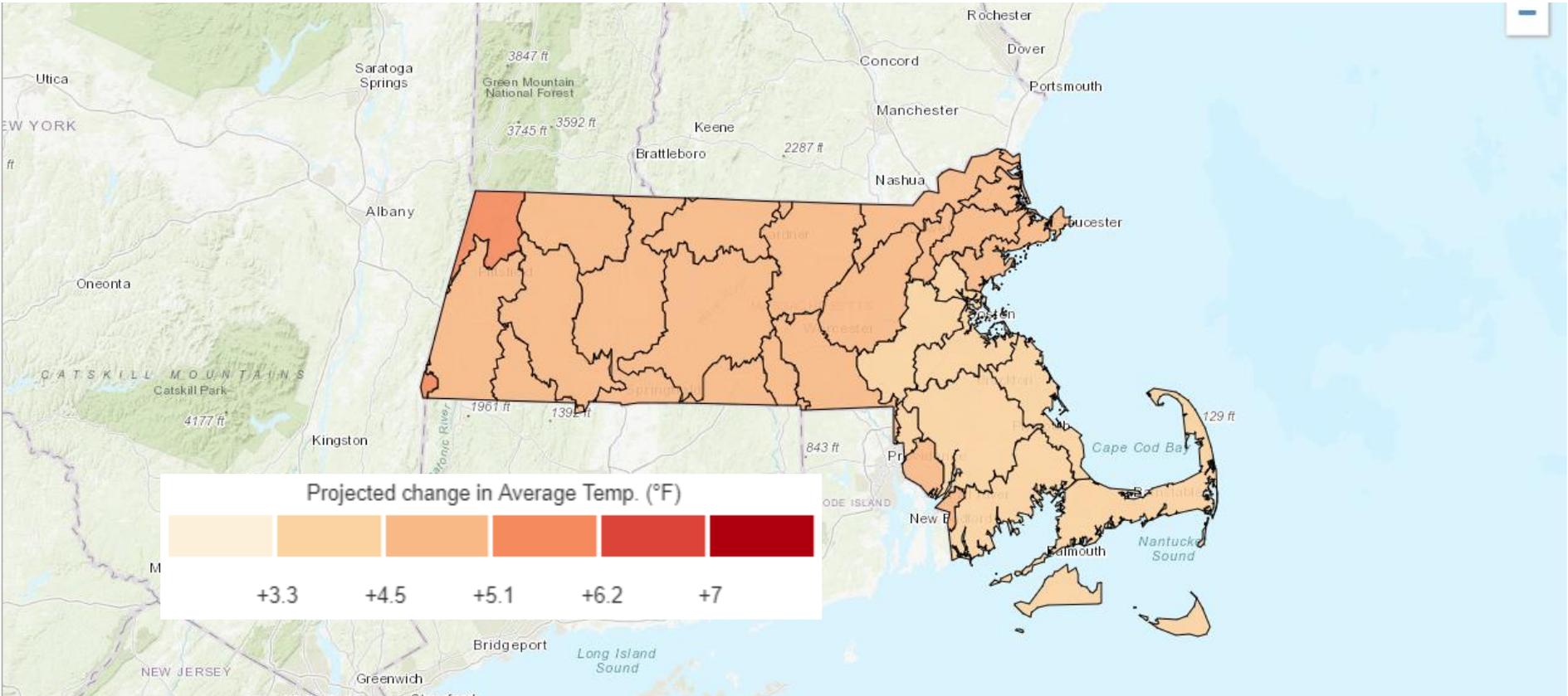
Boston Harbor

Typical Downscaled and Global Climate Model Resolution



Climate Change Indicators by Geographic Scale

2050s Annual Average Temperature Change



HUC-8 Watersheds

Climate Data and Planning

- The current and projected trajectory of many changes in climate are clear.
- Local variations are most often within the projected margin of error of climate models. Local variations are usually not practically significant.
- The resolution of climate data is not usually a limiting factor in planning. At the local scale, other factors may play a larger role.

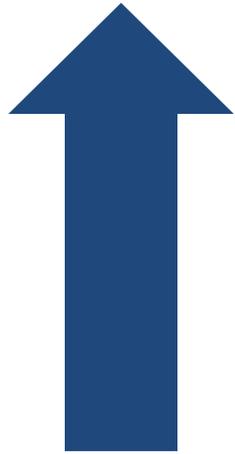
More Precipitation

**Total annual precipitation
has increased by:**

15%

1.2 trillion more gallons of
water equivalent falling on
Massachusetts each year.

~9,700 filled Prudential Towers



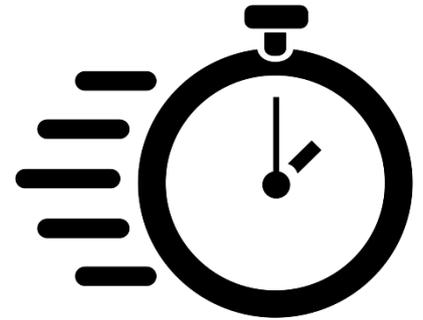
Change in 24-hour, 100-year Design Storms (inches)

	NOAA TP-40	NOAA Atlas 14	Change
Taunton	6.9"	7.7"	12%
Boston	6.6"	7.8"	18%
Worcester	6.5"	7.6"	17%

NOAA Atlas 14: <http://hdsc.nws.noaa.gov/hdsc/pfds/>

An anecdotal rule of thumb for anticipating changes in extreme precipitation...

Models often project a return period shorter by a factor of 2 to 4.



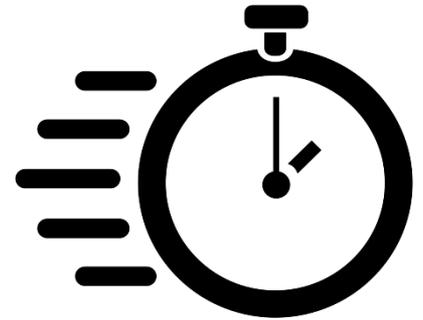
Often:



But projections vary place-to-place.

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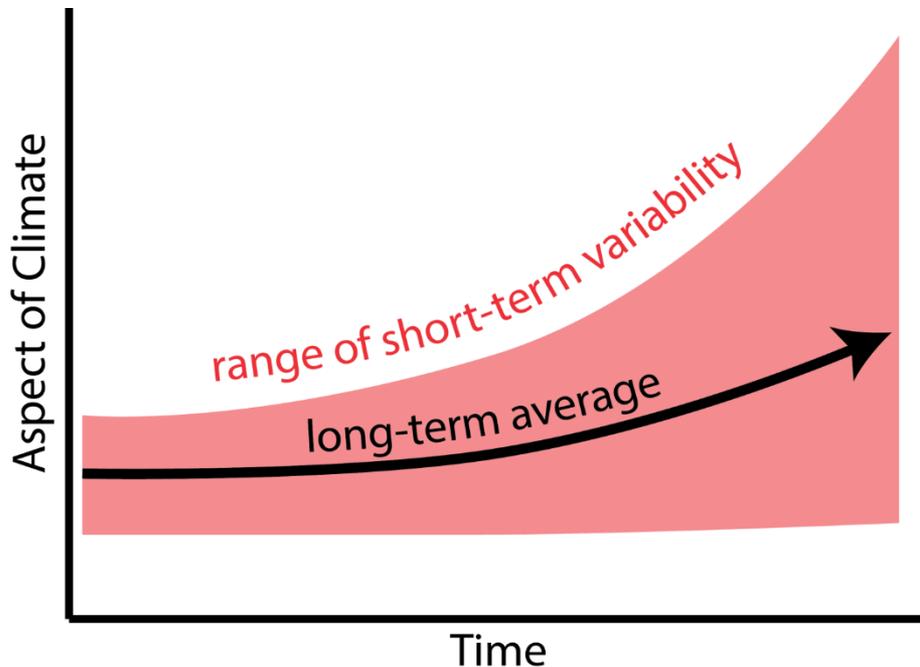
Often:



But projections vary place-to-place.

Long-term change doesn't rule out shorter-term variability.

Example: Even as average temperatures warm, we will still experience winter storms.



Impact Example: Water Infrastructure Freeze Vulnerability

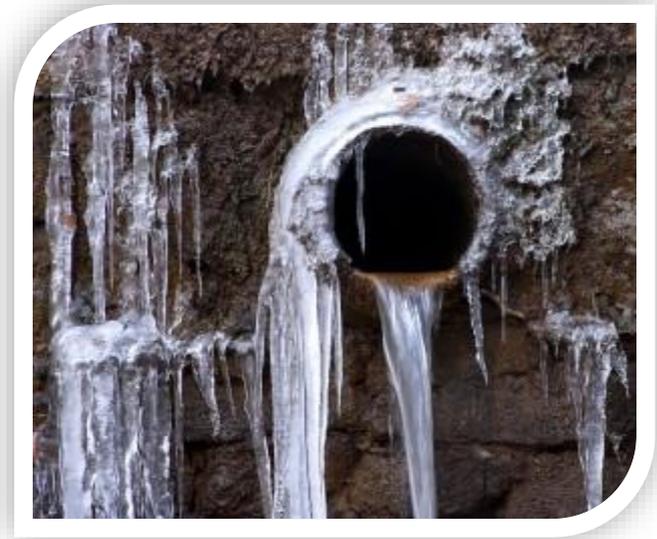
**Rising winter temperatures
reduce spring snow cover.**

+

**Risk of spring cold snaps
remains relatively stable.**

=

**Increased subsurface
freeze risk**



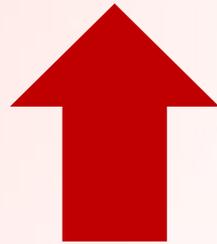
Impact Example: Public Health Algal Blooms

West Monponsett Pond, Halifax, Massachusetts



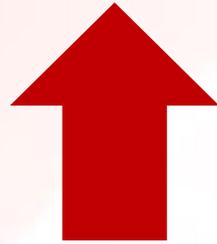
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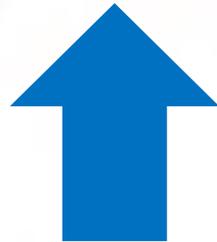
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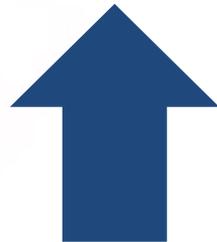
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