DELAWARE COUNTY'S CHANGING CLIMATE

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Delaware Valley Regional Planning Commission

Delaware County Municipal Flood Resilience Meeting

August 21, 2018

DELAWARE VALLEY dvrpc REGIONAL PLANNING COMMISSION

OVERVIEW

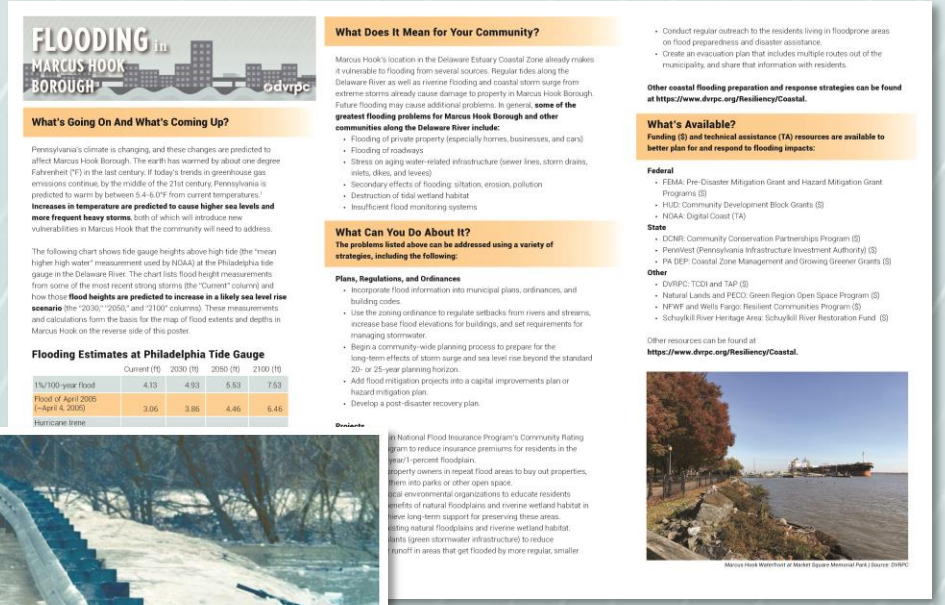
- About DVRPC
- Observed Changes
- Projections and Uncertainty
  - Temperature
  - Precipitation
- Coastal Hazards
- What Can We Do?

ABOUT DVRPC

- Federally-designated MPO for nine-county Philadelphia region in PA and NJ
- Created in 1965 to plan for "orderly growth and development"
- Transportation, land use, open space, and economic development

RECENT RESILIENCE WORK

- PA Coastal Resiliency
- New Jersey Resilient Coastal Communities Initiative
- *Chester City Climate Adaptation Plan*
- Climate Adaptation Forum
- *Municipal Management in a Changing Climate*



FLOODING in MARCUS HOOK BOROUGH

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What's Going On And What's Coming Up?

Pennsylvania's climate is changing, and these changes are predicted to affect Marcus Hook Borough. The earth has warmed by about one degree Fahrenheit (°F) in the last century. If today's trends in greenhouse gas emissions continue, by the middle of the 21st century, Pennsylvania is predicted to warm by between 5.4–6.0°F from current temperatures.[1] **Increases in temperature are predicted to cause higher sea levels and more frequent heavy storms**, both of which will introduce new vulnerabilities in Marcus Hook that the community will need to address.

The following chart shows tide gauge heights above high tide (the "mean higher high water" measurement used by NOAA) at the Philadelphia tide gauge in the Delaware River. The chart lists flood height measurements from some of the most recent strong storms (the "Current" column) and how those **flood heights are predicted to increase in a likely sea level rise scenario** (the "2030," "2050," and "2100" columns). These measurements and calculations form the basis for the map of flood extents and depths in Marcus Hook on the reverse side of this poster.

Flooding Estimates at Philadelphia Tide Gauge

	Current (ft)	2030 (ft)	2050 (ft)	2100 (ft)
1%/100-year flood	4.13	4.93	5.53	7.53
Flood of April 2005 (–April 4, 2005)	3.06	3.86	4.46	6.46
Hurricane Irene				

What Does It Mean for Your Community?

Marcus Hook's location in the Delaware Estuary Coastal Zone already makes it vulnerable to flooding from several sources. Regular tides along the Delaware River as well as riverine flooding and coastal storm surge from extreme storms already cause damage to property in Marcus Hook Borough. Future flooding may cause additional problems. In general, **some of the greatest flooding problems for Marcus Hook Borough and other communities along the Delaware River include:**

- Flooding of private property (especially homes, businesses, and cars)
- Flooding of roadways
- Stress on aging water-related infrastructure (sewer lines, storm drains, inlets, dikes, and levees)
- Secondary effects of flooding: siltation, erosion, pollution
- Destruction of tidal wetland habitat
- Insufficient flood monitoring systems

What Can You Do About It?

The problems listed above can be addressed using a variety of strategies, including the following:

Plans, Regulations, and Ordinances

- Incorporate flood information into municipal plans, ordinances, and building codes.
- Use the zoning ordinance to regulate setbacks from rivers and streams, increase base flood elevations for buildings, and set requirements for managing stormwater.
- Begin a community-wide planning process to prepare for the long-term effects of storm surge and sea level rise beyond the standard 20- or 25-year planning horizon.
- Add flood mitigation projects into a capital improvements plan or hazard mitigation plan.
- Develop a post-disaster recovery plan.

Projects

- Participate in National Flood Insurance Program's Community Rating System program to reduce insurance premiums for residents in the 100-year/1-percent floodplain.
- Buy out property owners in repeat flood areas to buy out properties, convert them into parks or other open space.
- Work with local environmental organizations to educate residents about the benefits of natural floodplains and riverine wetland habitat in order to receive long-term support for preserving these areas.
- Restore existing natural floodplains and riverine wetland habitat.
- Use BMPs (plants (green stormwater infrastructure) to reduce stormwater runoff in areas that get flooded by more regular, smaller

- Conduct regular outreach to the residents living in floodprone areas on flood preparedness and disaster assistance.
- Create an evacuation plan that includes multiple routes out of the municipality, and share that information with residents.

Other coastal flooding preparation and response strategies can be found at https://www.dvrpc.org/Resiliency/Coastal.

What's Available?

Funding ($) and technical assistance (TA) resources are available to better plan for and respond to flooding impacts:

Federal

- FEMA: Pre-Disaster Mitigation Grant and Hazard Mitigation Grant Programs ($)
- HUD: Community Development Block Grants ($)
- NOAA: Digital Coast (TA)

State

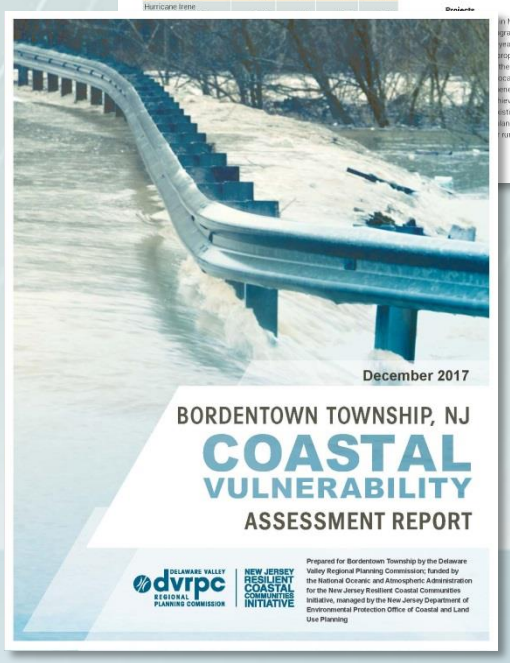
- DCNR: Community Conservation Partnerships Program ($)
- PennVest (Pennsylvania Infrastructure Investment Authority) ($)
- PA DEP: Coastal Zone Management and Growing Greener Grants ($)

Other

- DVRPC: TCDI and TAP ($)
- Natural Lands and PECO: Green Region Open Space Program ($)
- NFWF and Wells Fargo: Resilient Communities Program ($)
- Schuylkill River Heritage Area: Schuylkill River Restoration Fund ($)

Other resources can be found at **https://www.dvrpc.org/Resiliency/Coastal.**

Marcus Hook Waterfront at Market Square Memorial Park | Source: DVRPC



December 2017

BORDENTOWN TOWNSHIP, NJ

COASTAL VULNERABILITY ASSESSMENT REPORT

DELAWARE VALLEY dvrpc REGIONAL PLANNING COMMISSION | NEW JERSEY RESILIENT COASTAL COMMUNITIES INITIATIVE

Prepared for Bordentown Township by the Delaware Valley Regional Planning Commission; funded by the National Oceanic and Atmospheric Administration for the New Jersey Resilient Coastal Communities Initiative, managed by the New Jersey Department of Environmental Protection Office of Coastal and Land Use Planning

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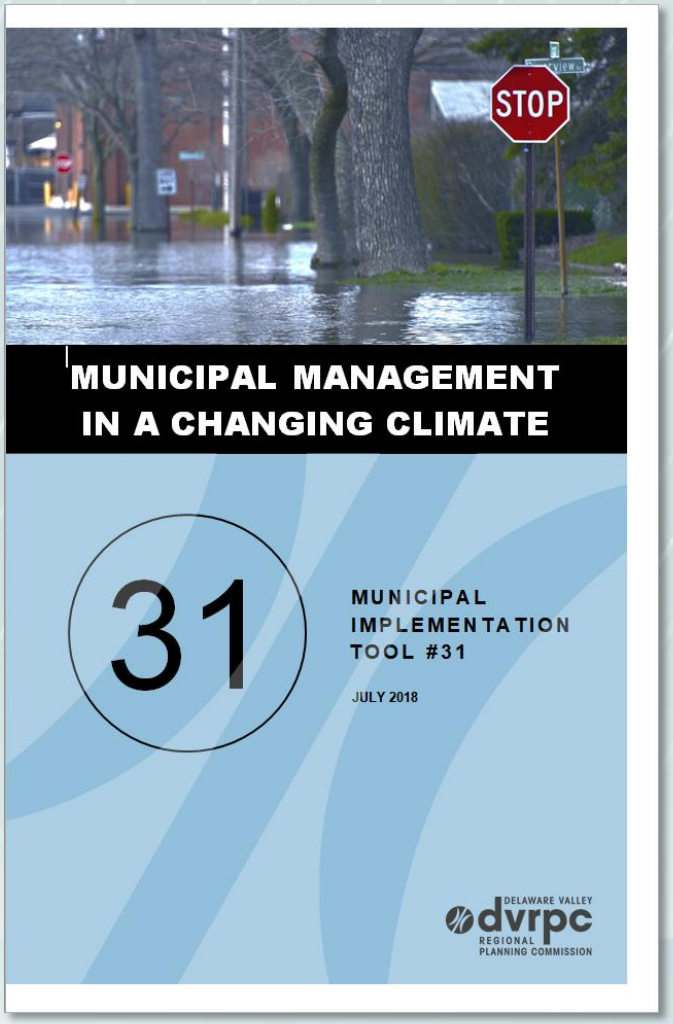
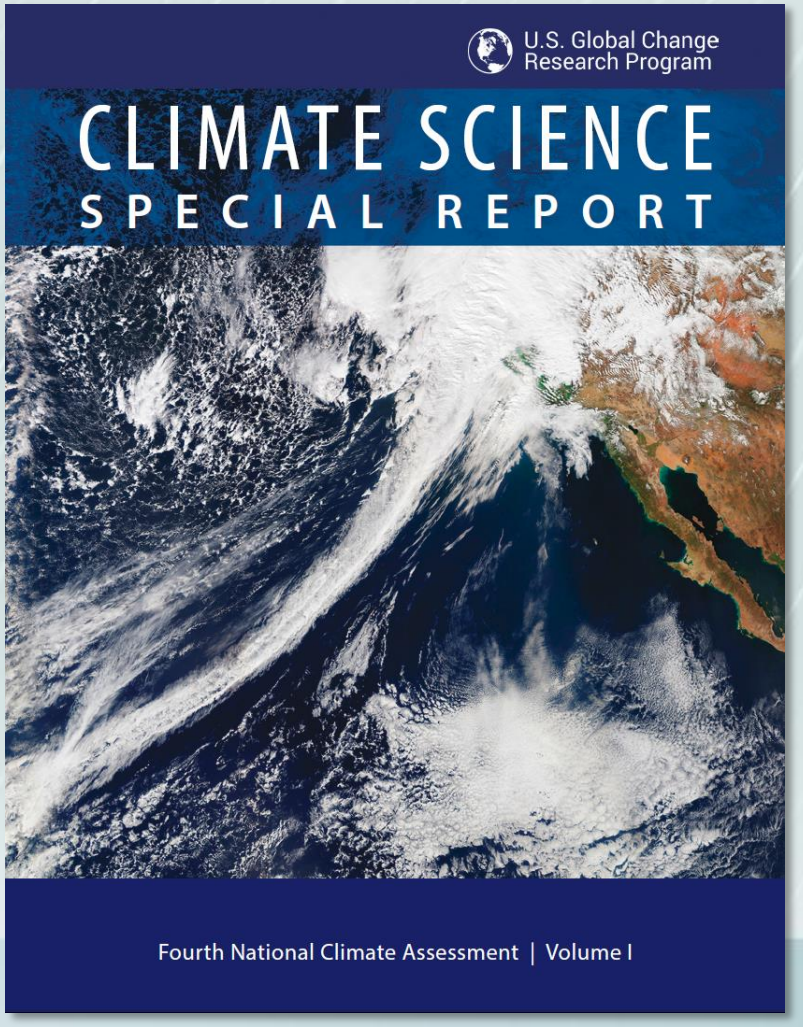
KEY CONCEPTS

- Climate change/global warming is real, and it's happening
- Climate change will affect everyday life in Delaware County
- Historical precedents are becoming increasingly less helpful for long-term planning
- Beyond 20 to 30 years, uncertainty and potential impacts increase

DATA SOURCES





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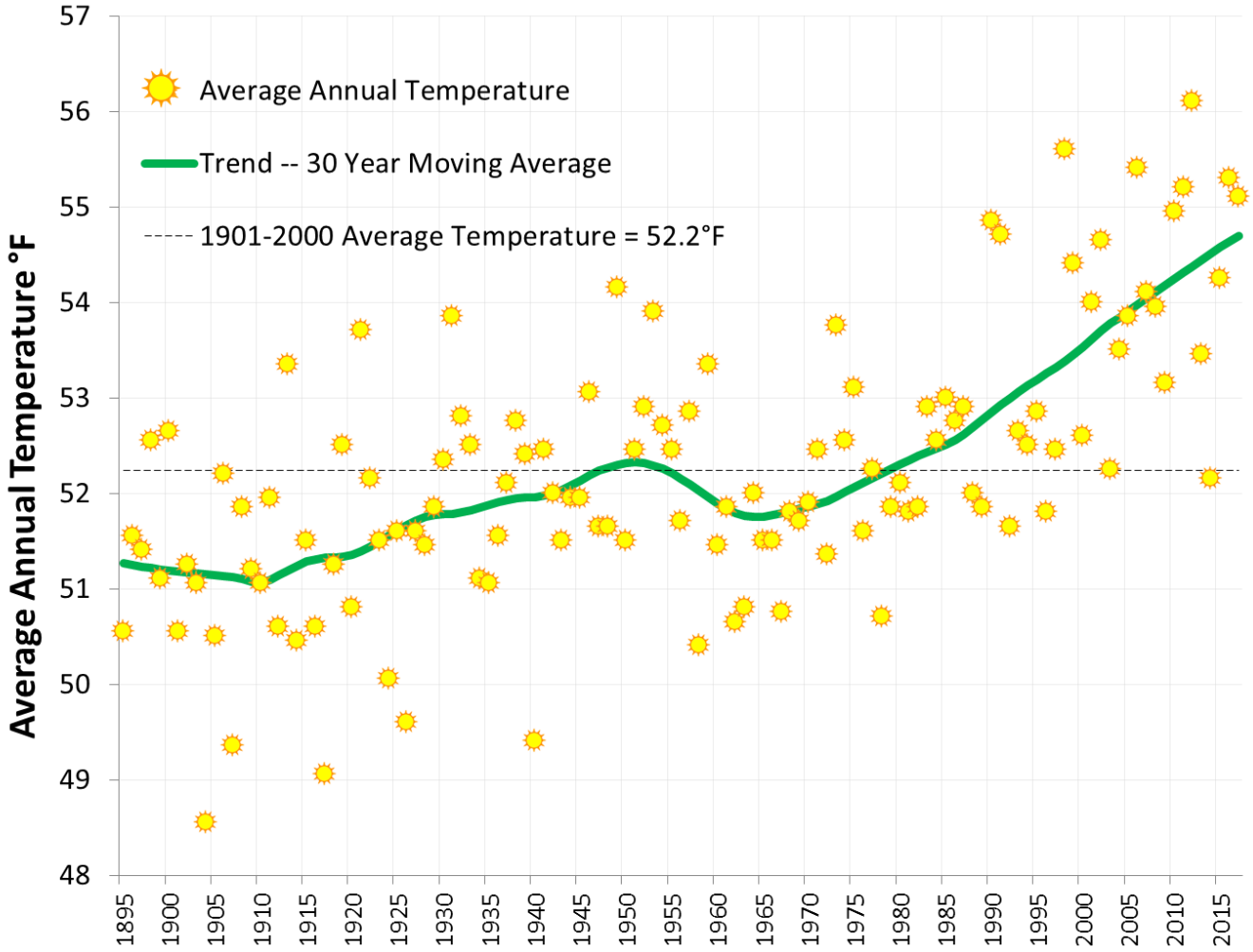
AVERAGE REGIONAL TEMPERATURE (1895-2017)



Source: DVRPC chart using data accessed 24 May 2018 from www.ncdc.noaa.gov/cag/. Data reflects the average of two regions: SE PA (Climate Div.3) and Southern NJ (Climate Div.2).

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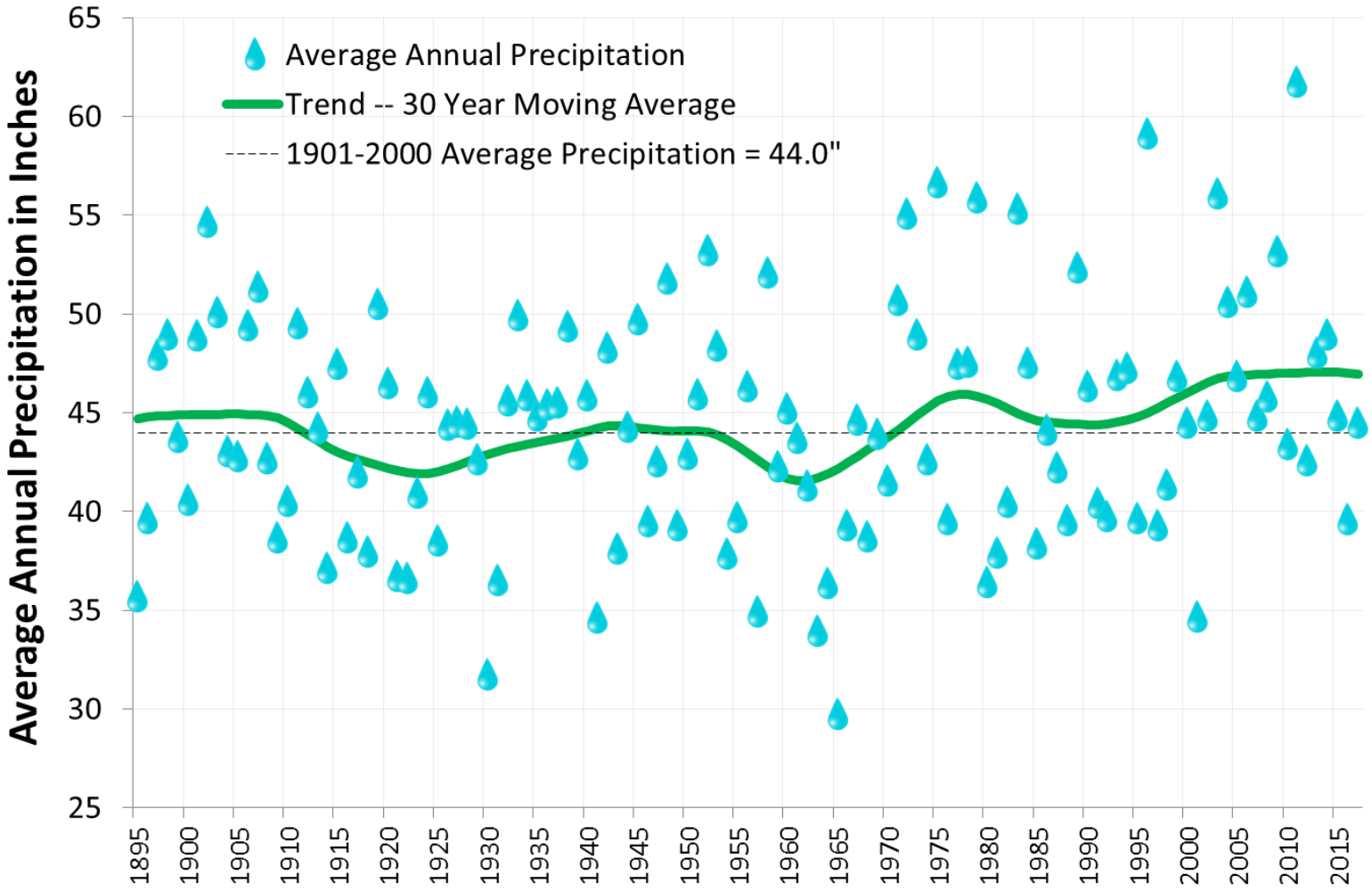
AVERAGE REGIONAL PRECIPITATION (1895-2017)



Source: DVRPC chart using data accessed 24 May 2018 from www.ncdc.noaa.gov/cag/.

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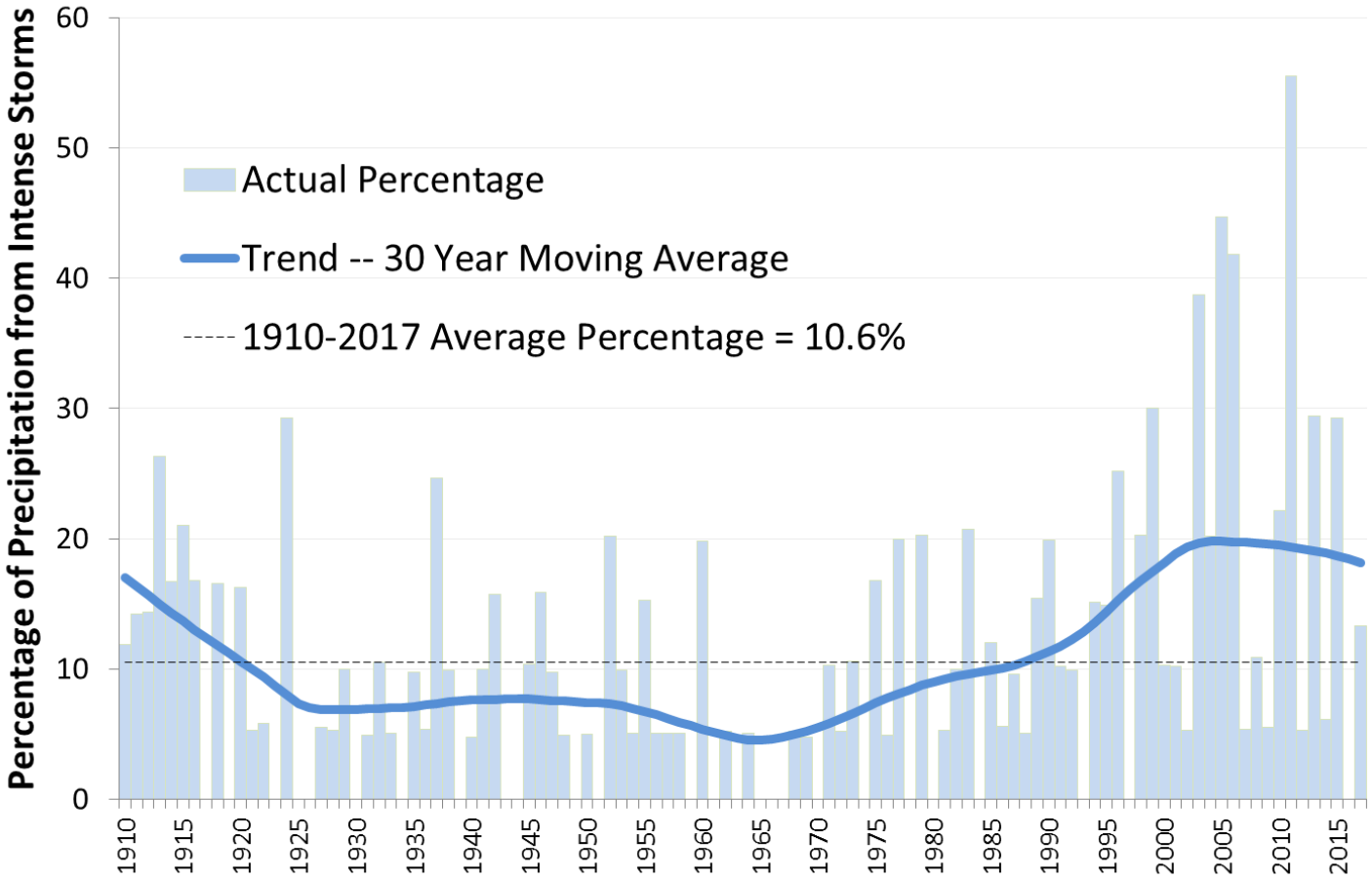
PRECIPITATION FROM INTENSE STORMS IN NORTHEASTERN US (1895–2017)



Source: DVRPC chart using data accessed 24 May 2018 from www.ncdc.noaa.gov/cag/.

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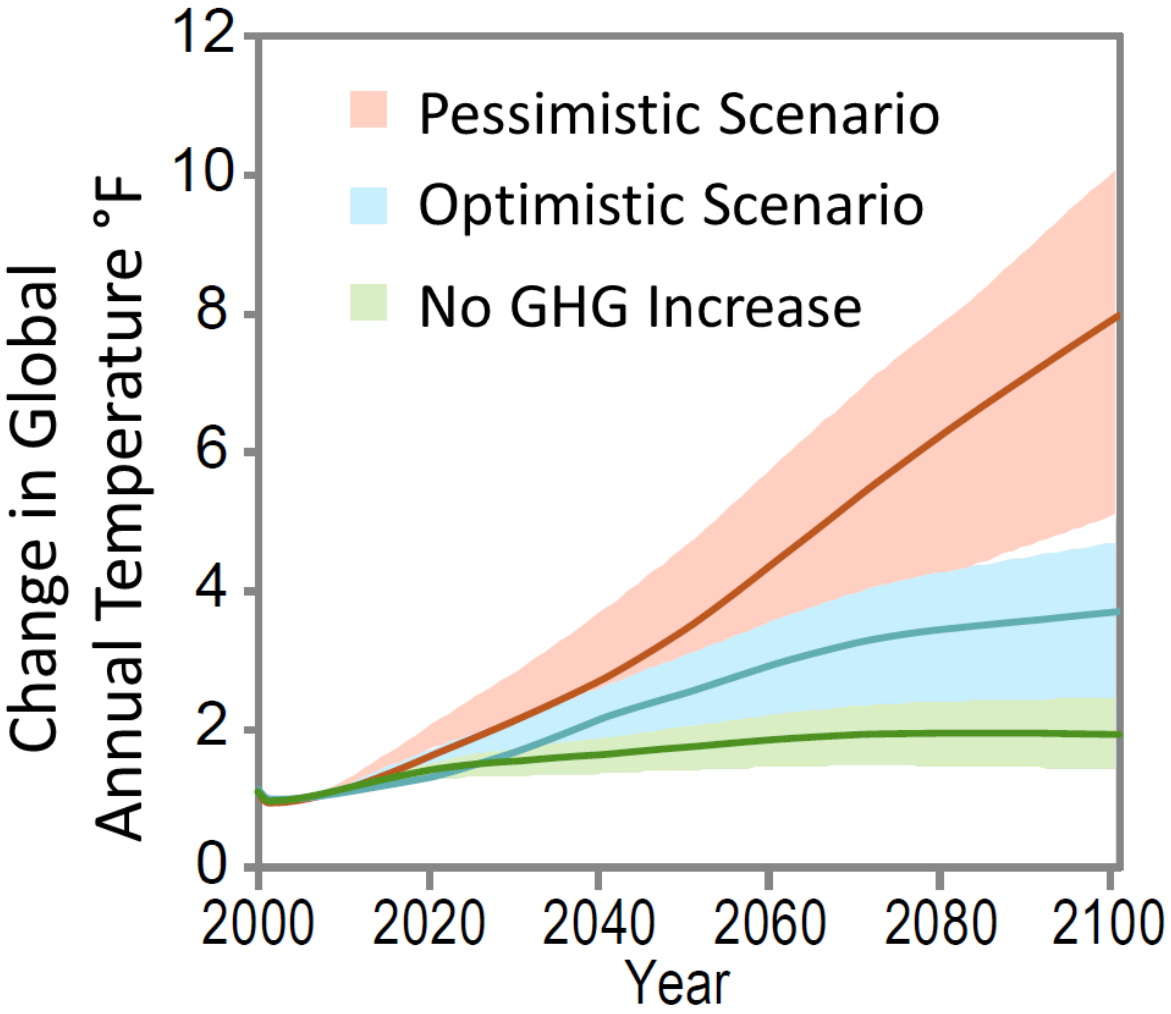
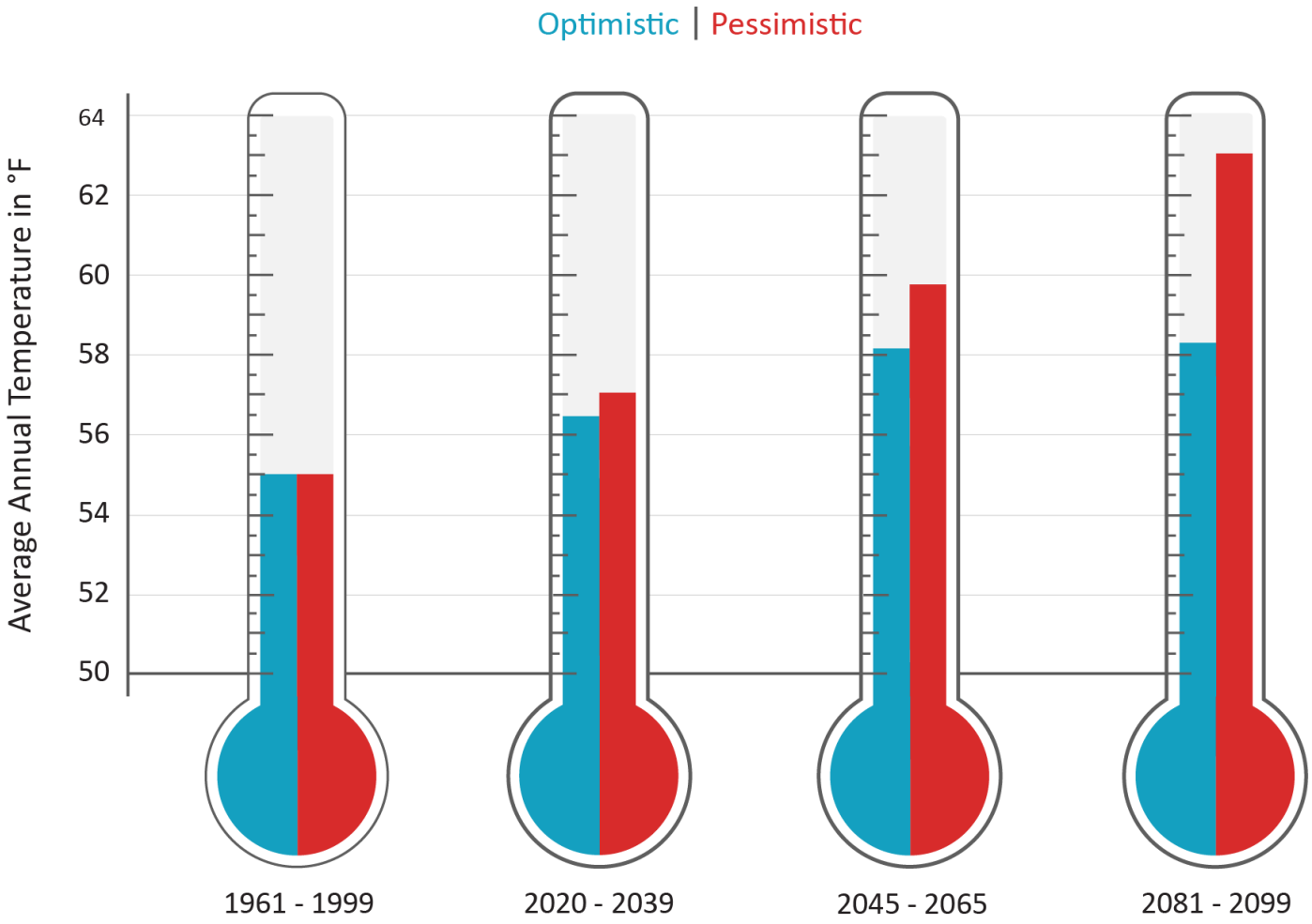
PROJECTED GLOBAL TEMPERATURE VS. 1960-2000 AVERAGE



Source: CSSR, p. 138.

AVERAGE ANNUAL TEMPERATURE IN THE REGION



Source: DVRPC chart using data provided by ICF.

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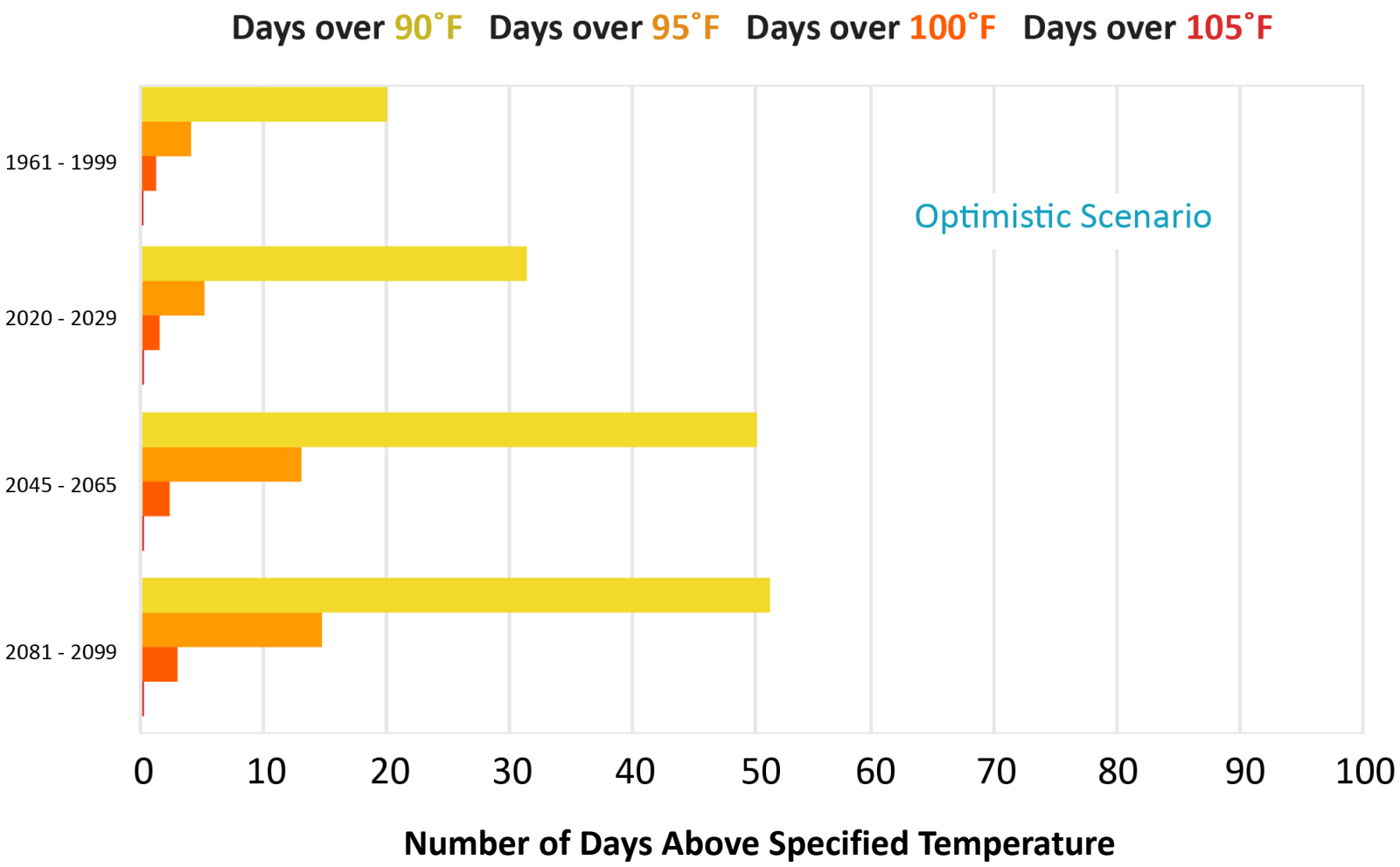
DAYS PER YEAR OVER 90° - OPTIMISTIC



Source: DVRPC chart using data provided by ICF.

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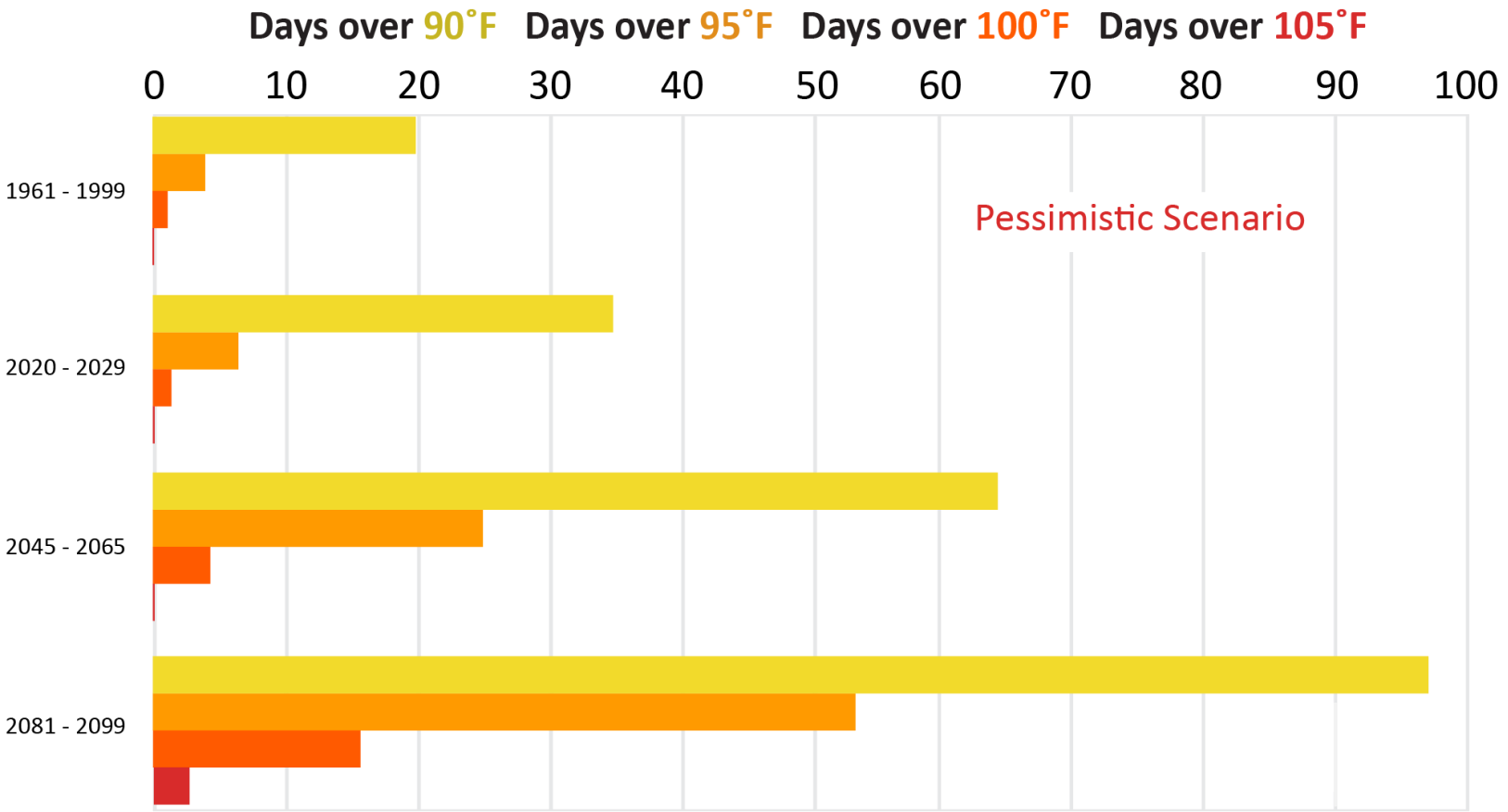
DAYS PER YEAR OVER 90° - PESSIMISTIC



Number of Days Above Specified Temperature

Source: DVRPC chart using data provided by ICF.

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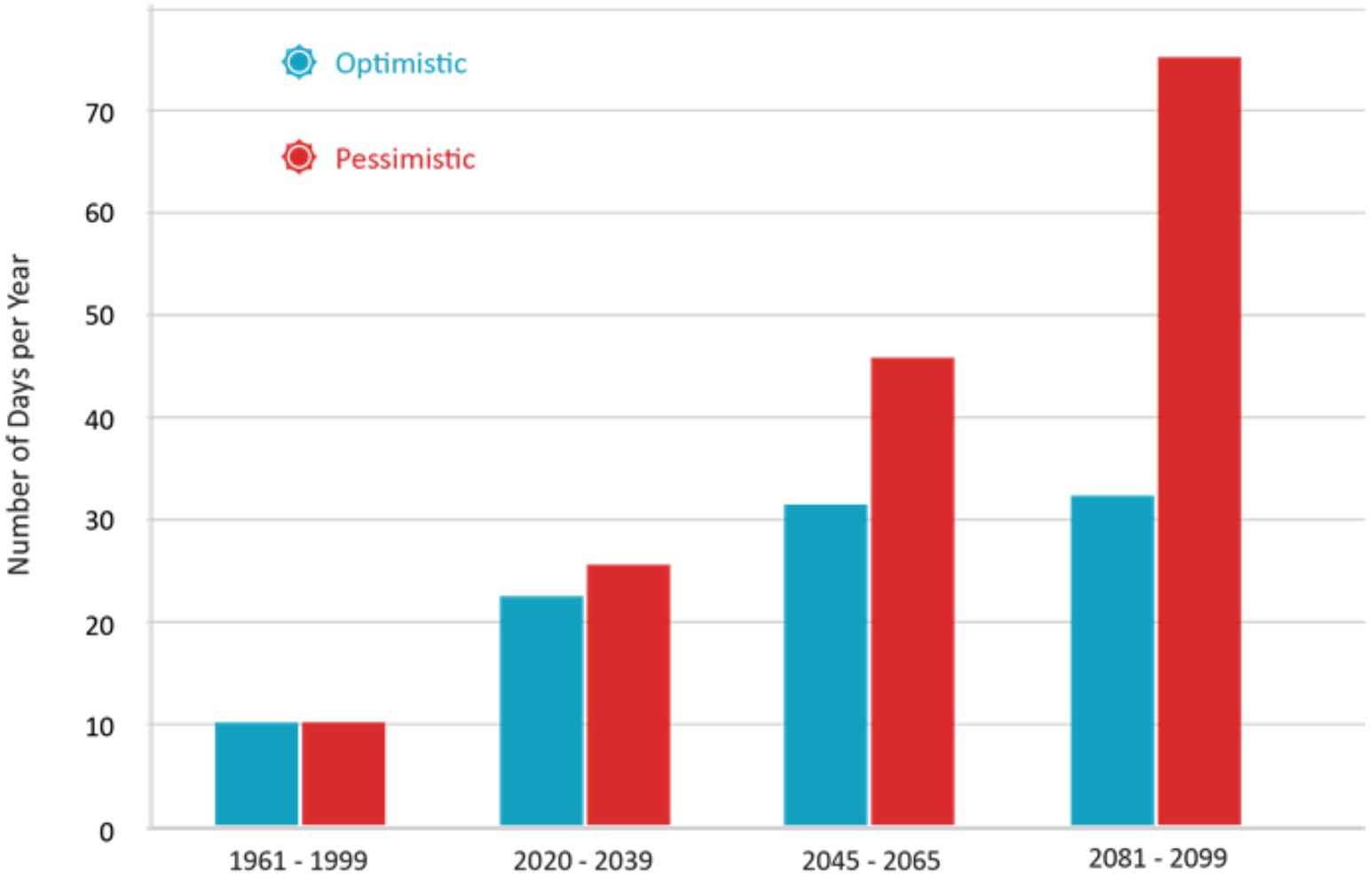
LOW TEMPERATURE ABOVE 70°F



Source: DVRPC chart using data provided by ICF.

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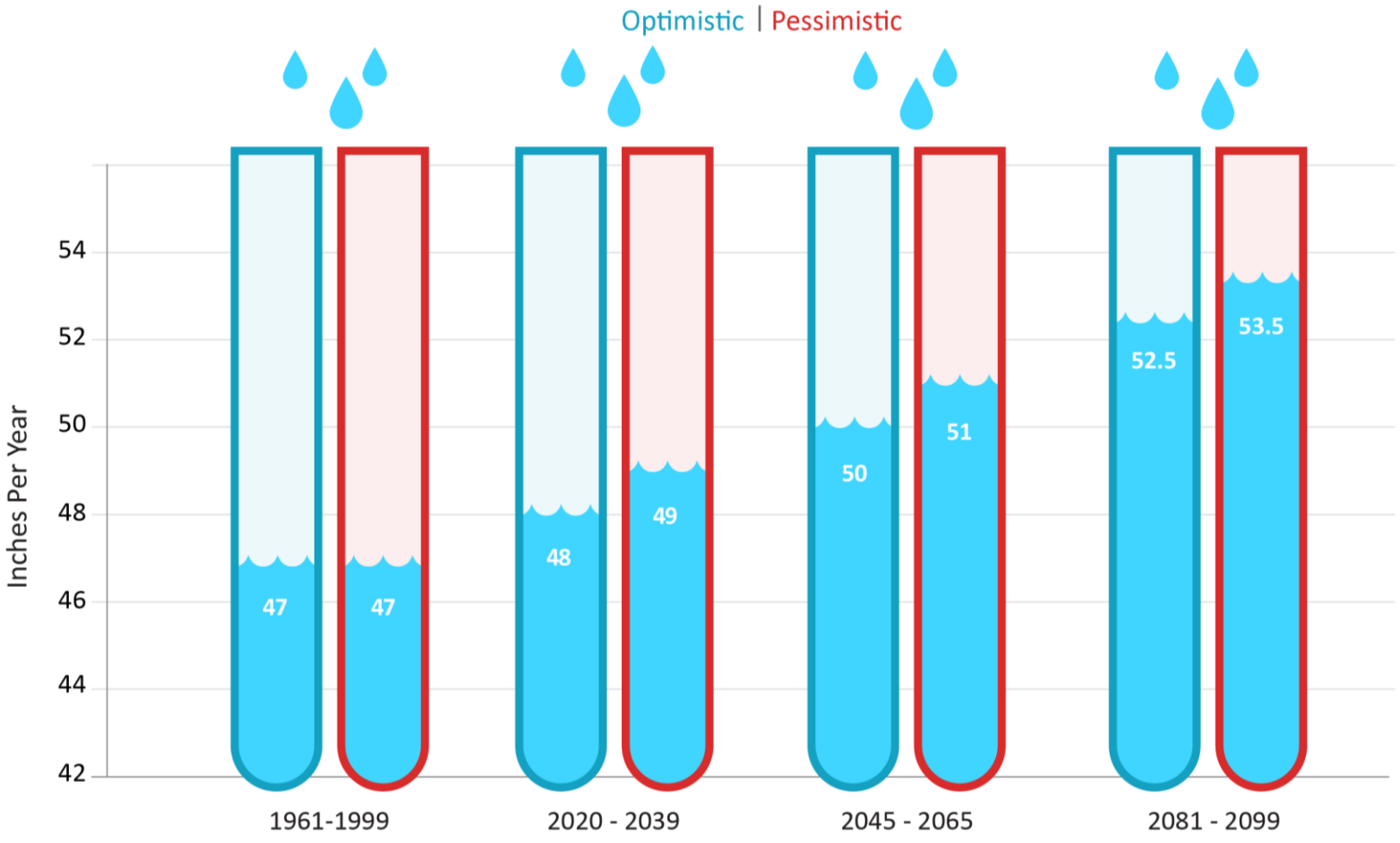
ANNUAL PRECIPITATION IN THE REGION



Source: DVRPC chart using data provided by ICF.

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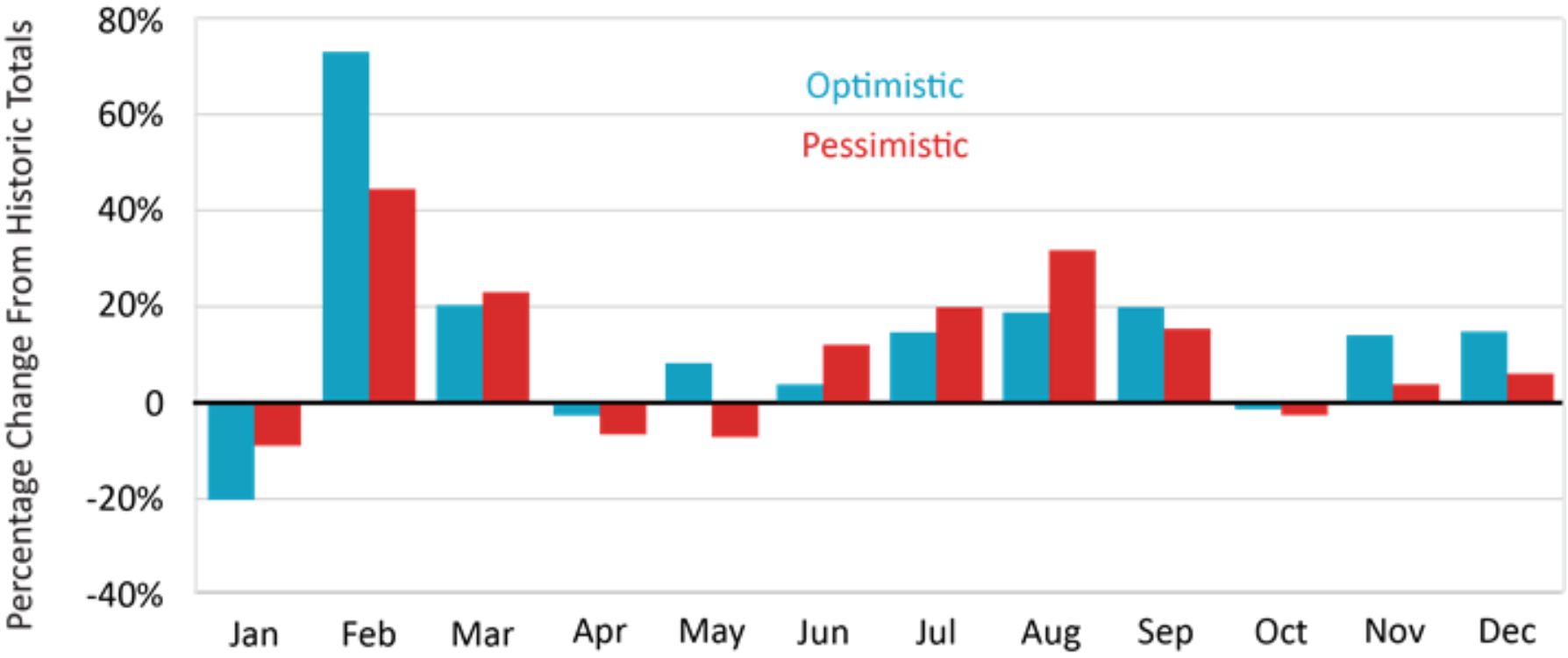
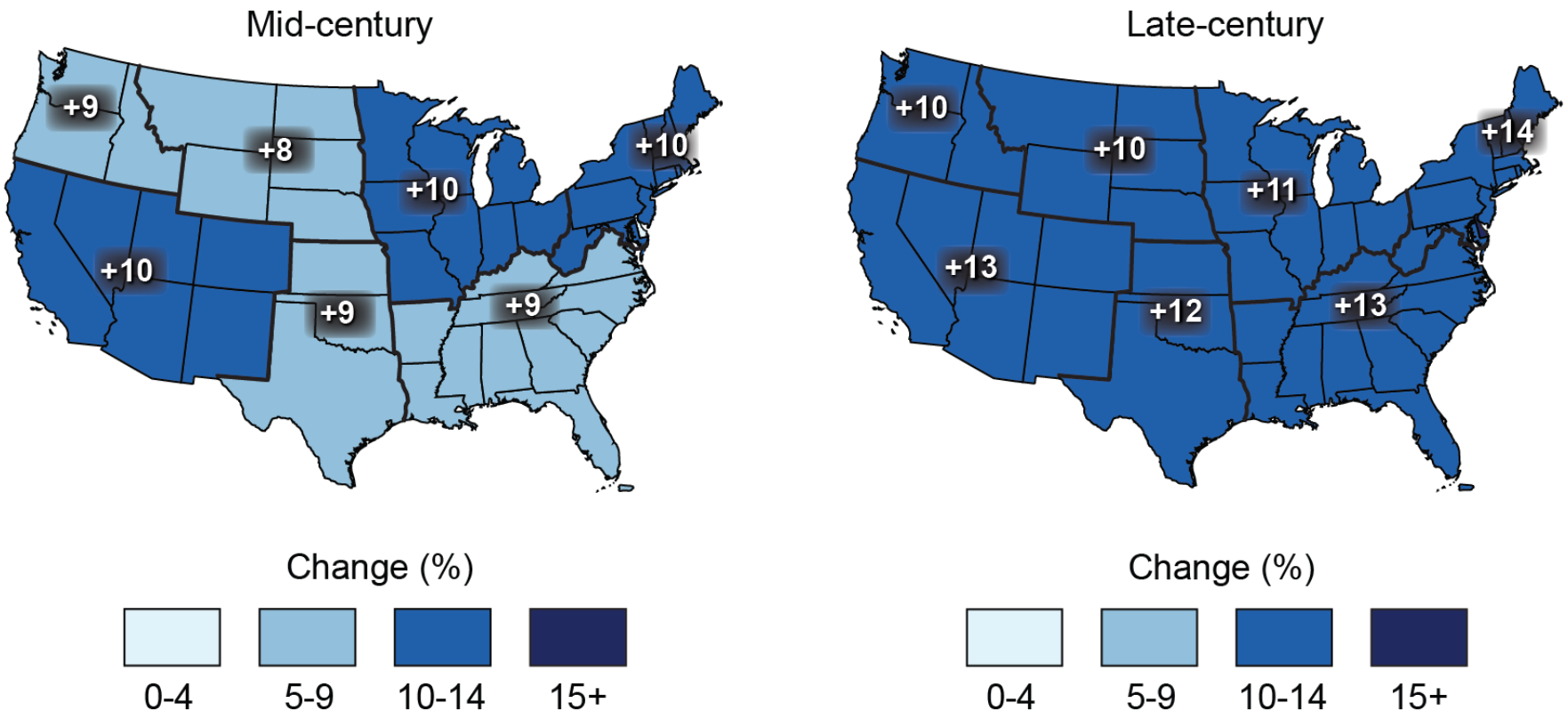
WETTER WINTERS AND SUMMERS



Source: DVRPC chart using data provided by ICF.

PROJECTED CHANGES IN EXTREME PRECIPITATION - OPTIMISTIC



Source: Kenneth Kunkle, CSSR

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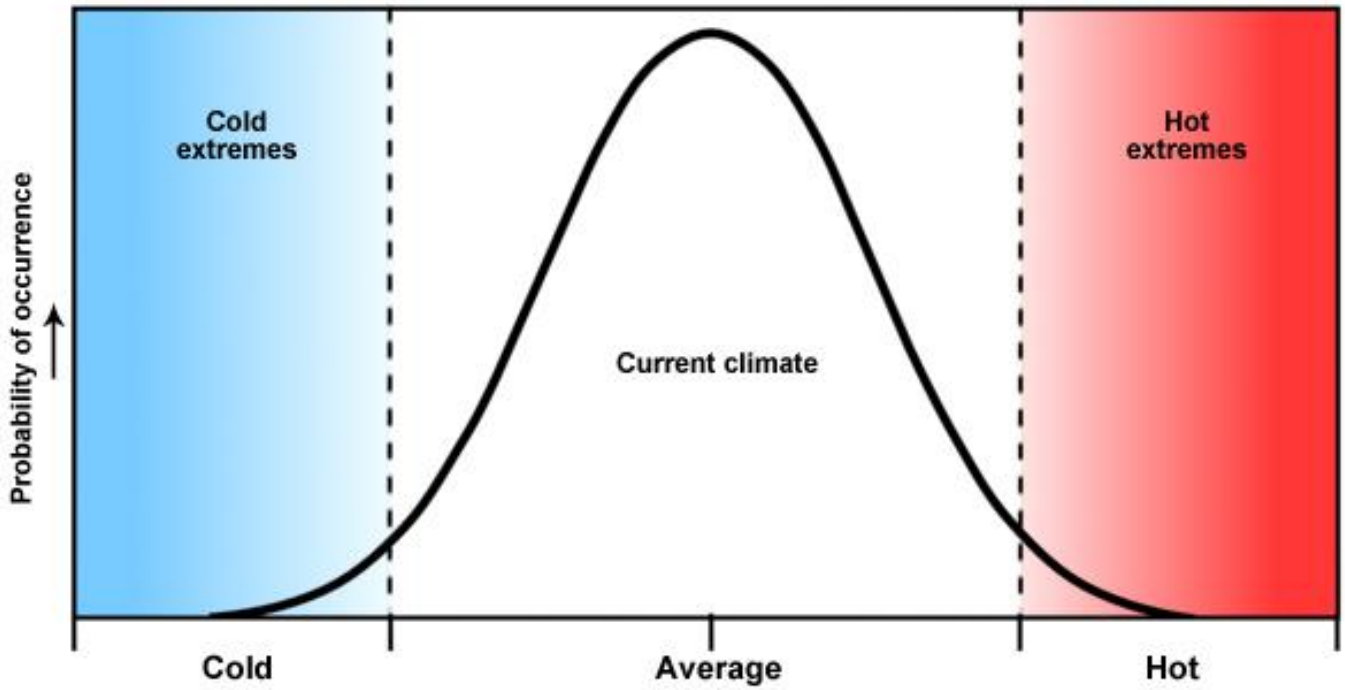
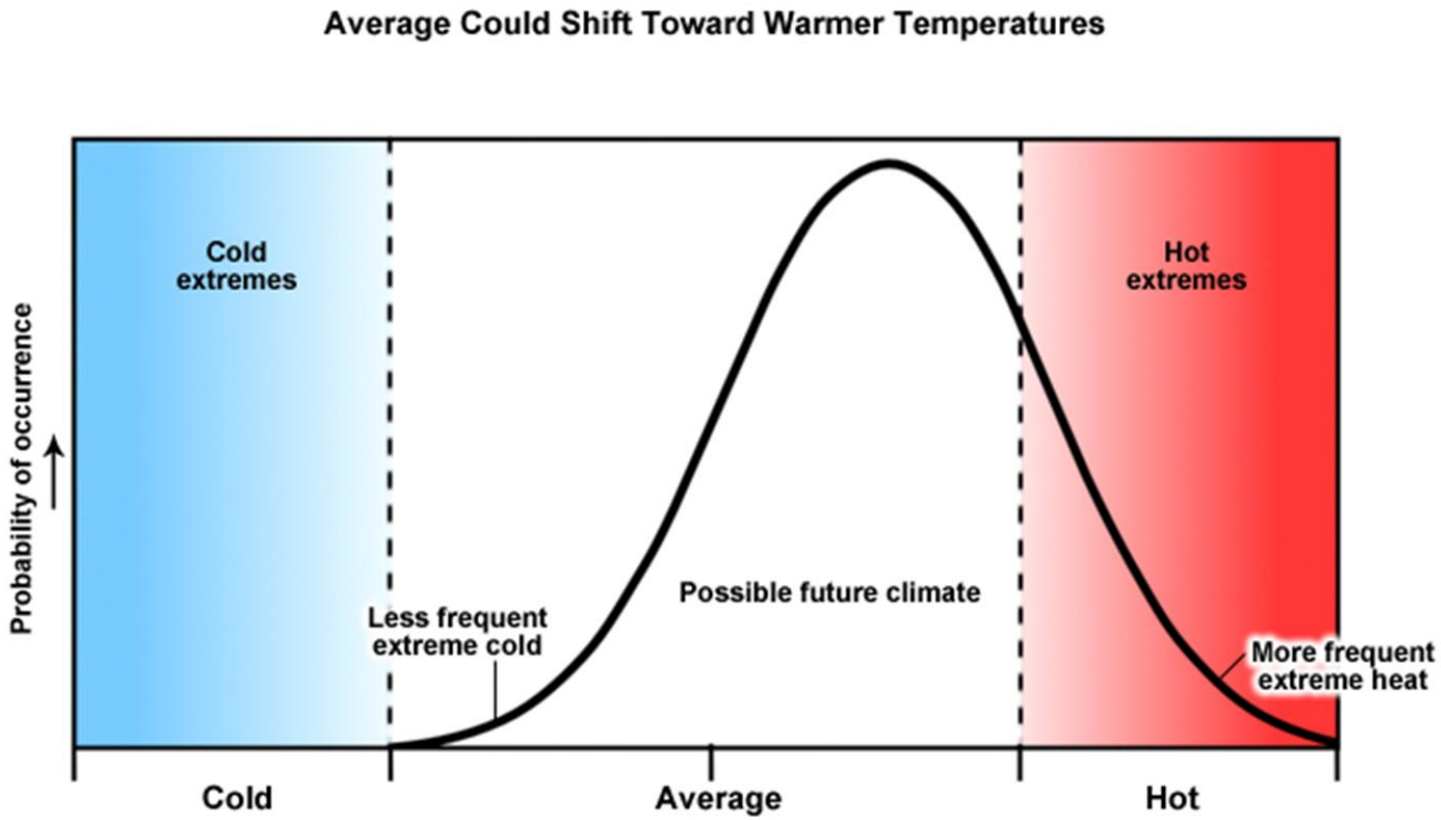
CLIMATE AND WEATHER TODAY



FUTURE CLIMATE AND WEATHER



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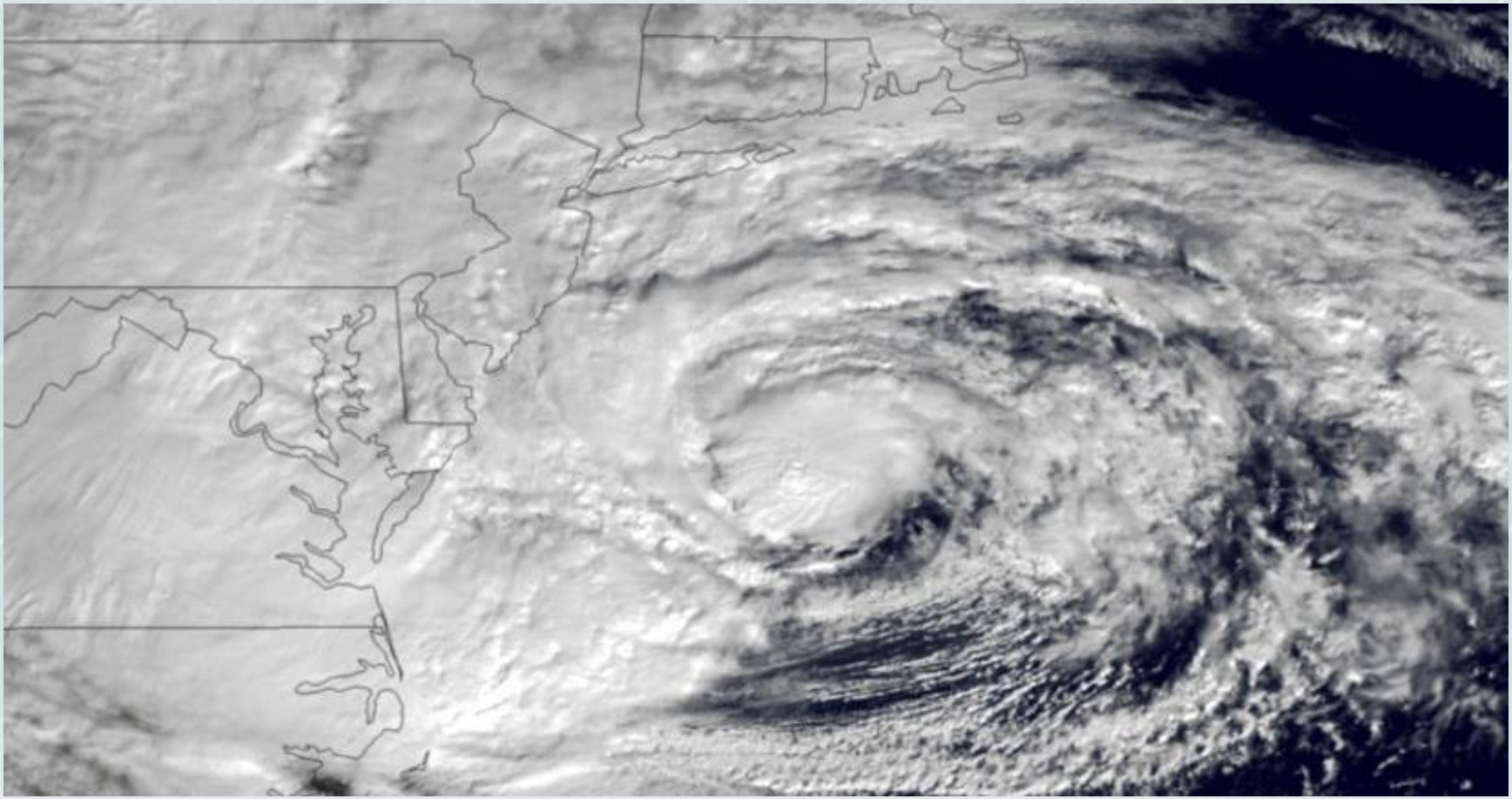
CHANGING COASTAL HAZARDS



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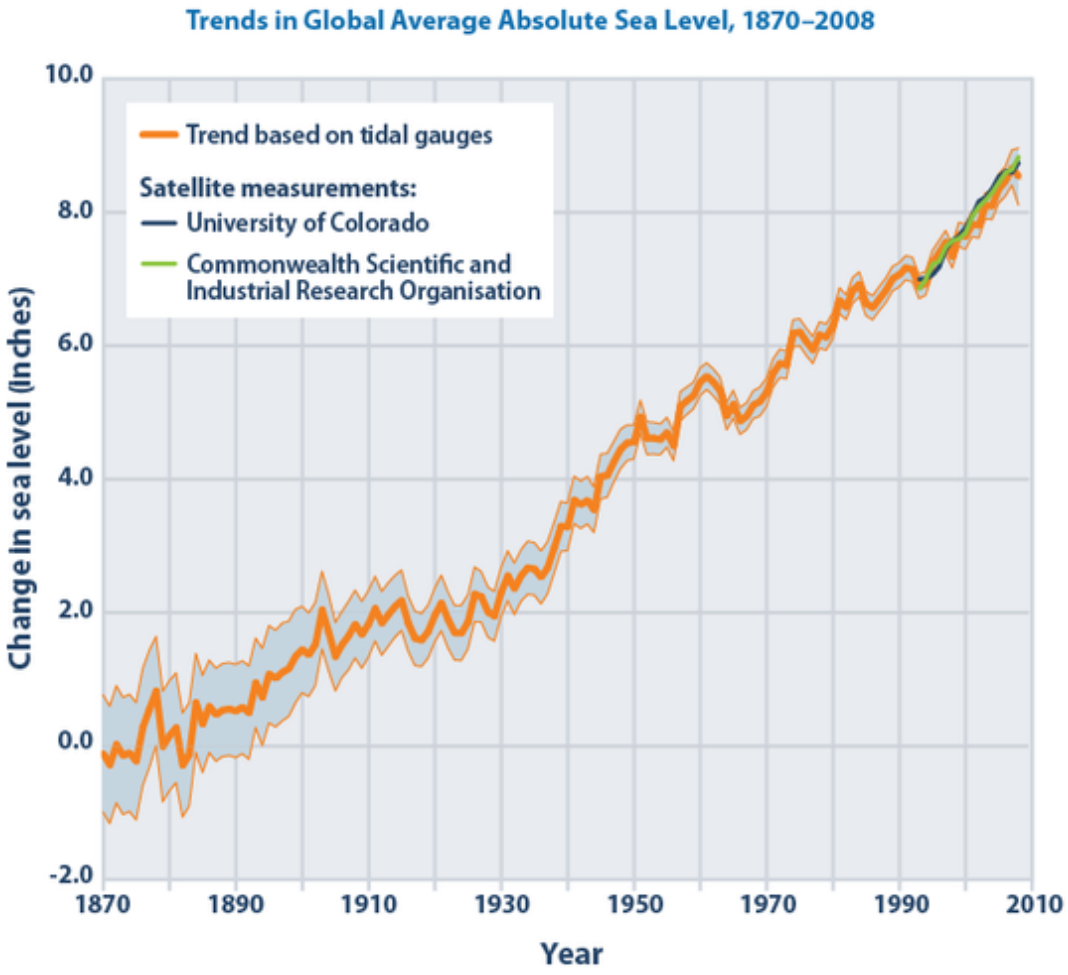
PAST SEA LEVEL RISE



Sources:

- CSIRD (Commonwealth Scientific and Industrial Research Organization). 2009 Sea level rise. Accessed November 2009. http://www.cmar.csiro.au/sealevel.
- University of Colorado at Boulder. 2009. Sea level change: 2009 release #2. http://sealevel.colorado.edu.

For more information, visit U.S. EPA's "Climate Change Indicators in the United States" at www.epa.gov/climatechange/scienc/indicators.

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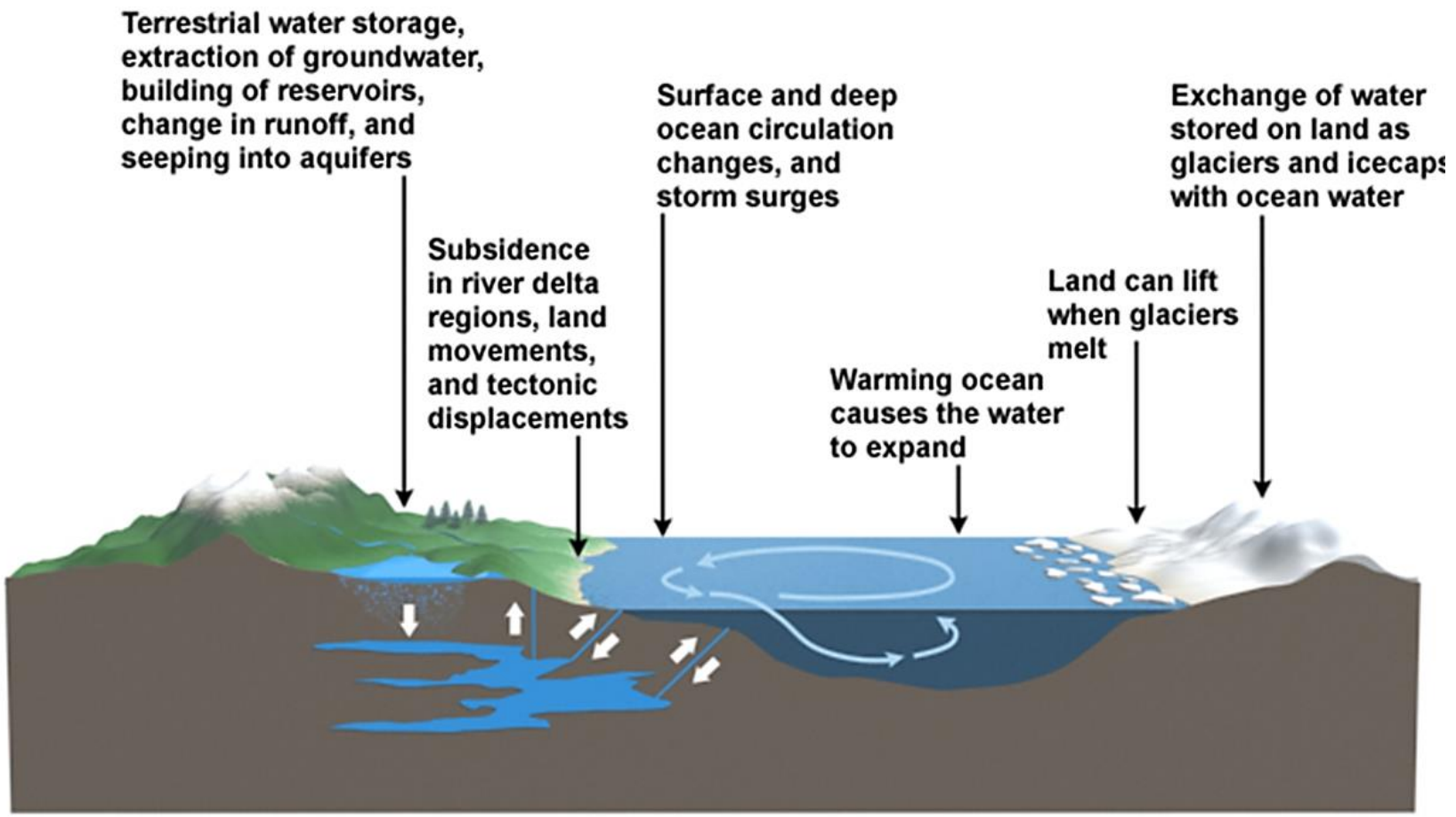
FACTORS CONTRIBUTING TO SEA LEVEL RISE



Source: The COMET Program, University Corporation for Atmospheric Research, *Climate Change and Sea Level Rise*

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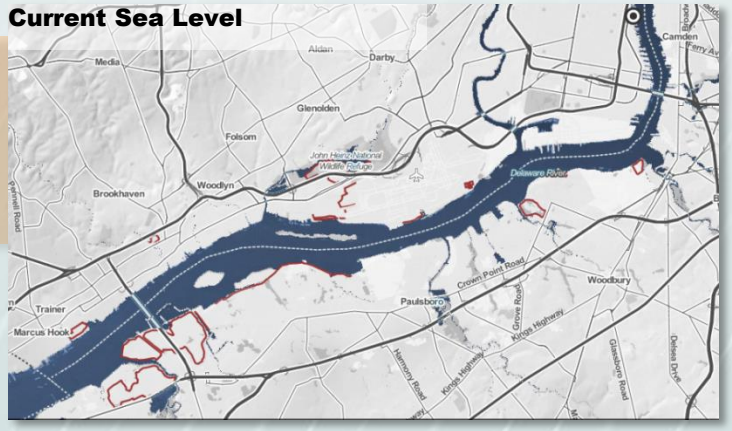
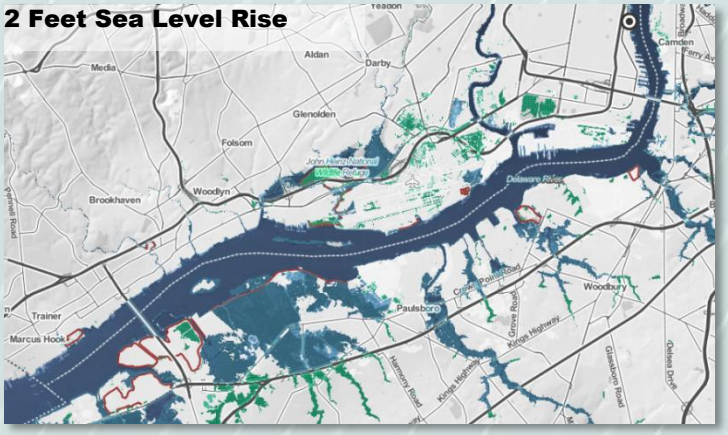
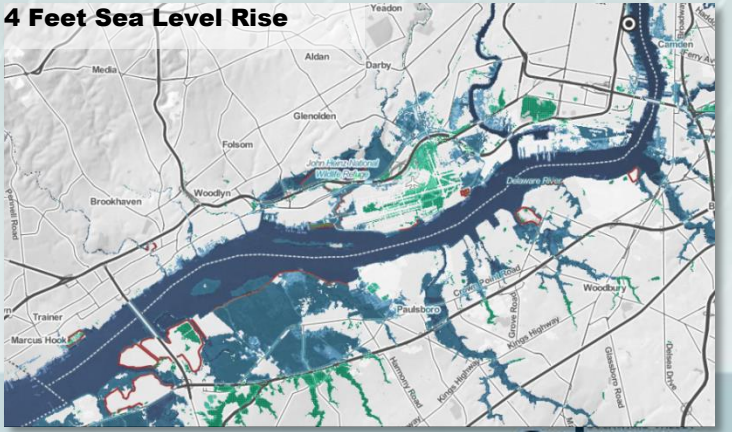
DELAWARE ESTUARY SEA LEVEL RISE SUMMARY

- Sea level rose by **1** foot during the 20th Century
- Sea level will rise by about **1.5** feet between now and 2050
- Sea level will rise by about **2** feet between 2050 and 2100







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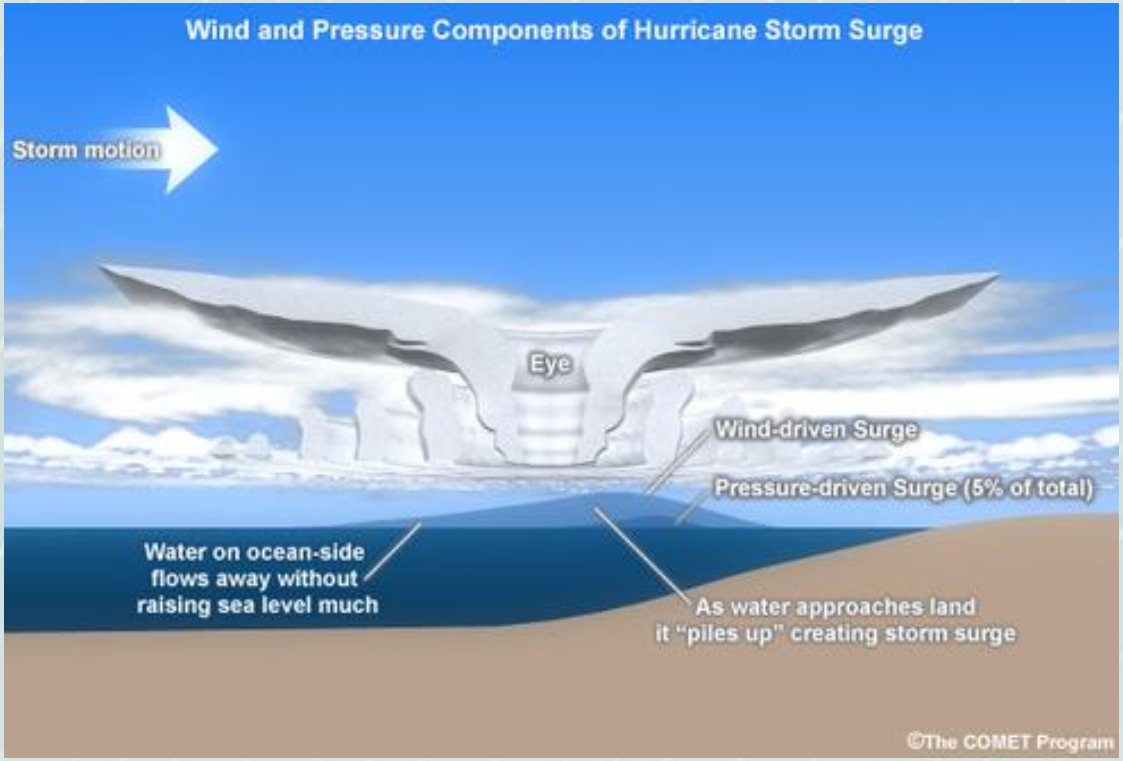
COASTAL STORMS AND STORM SURGE

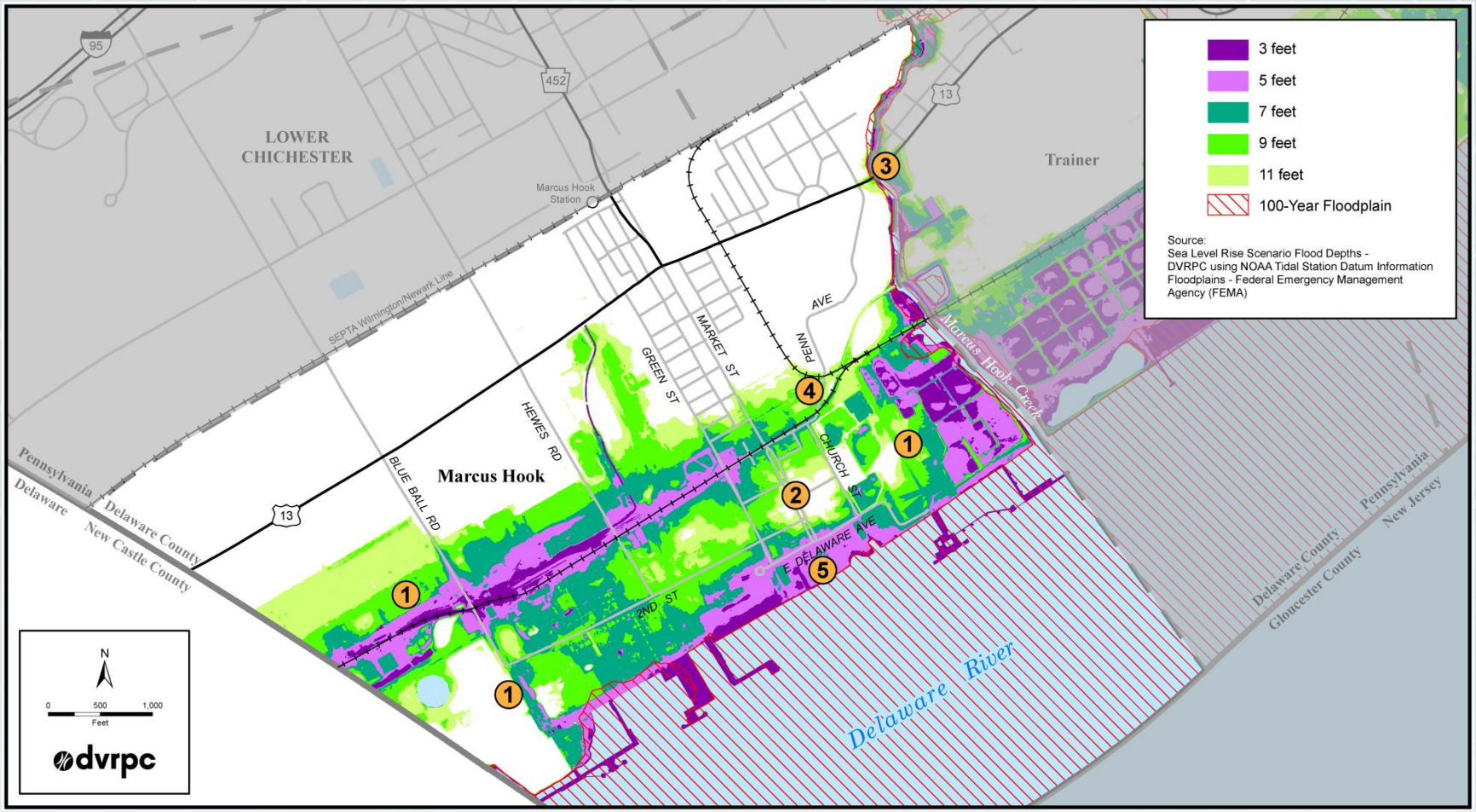
STORM SURGE MODELING

- SLOSH (sea, lake and overland surges from hurricanes) model
- SLOSH model shows worst possible scenarios for a given category of hurricane
- Sandy's surge in NYC – approx. 13 feet



Source: NOAA(Commonwealth Scientific and Industrial Research Organization). Storm Surge Overview. Accessed August 2018. https://www.nhc.noaa.gov/surge/.

STORM SURGE MODELING IN DELCO



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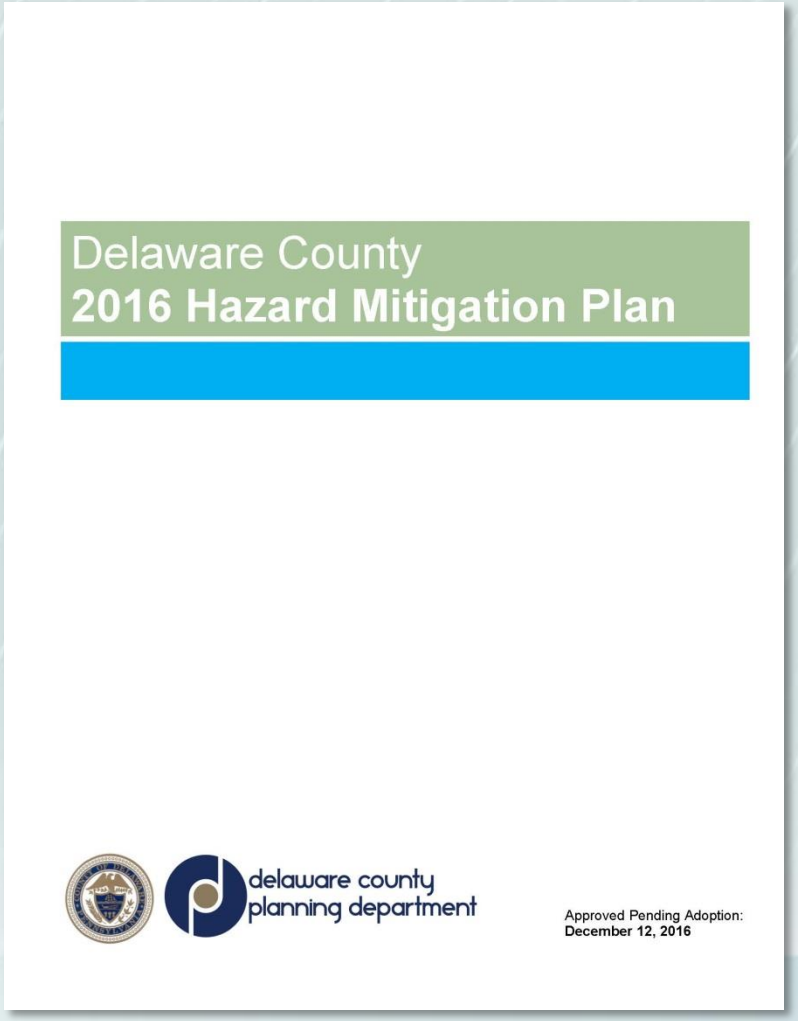
SO, WHAT CAN WE DO?

- Reduce GHG emissions
  - This reduces and slows—but cannot eliminate—climate change
- Prepare for projected changes
  - Resilience, adaptation, transformation
- Care for Those Suffering
  - Acknowledge there will be suffering, and prepare to ameliorate it

Source: Upper Darby Police @UDPolice

TAKE ACTION



- Include sea level rise and storm surge projections and maps in municipal and county plans (including HMP) and ordinances.
- Use municipal zoning and/or floodplain ordinances to protect community assets against flooding.
- Update base flood elevations for new construction or renovations using future flood heights.

QUESTIONS?

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