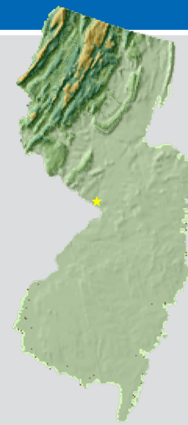
NEW JERSEY



Key Messages

Annual average temperatures have risen more than 3.5°F in New Jersey since the beginning of the 20th century. Under a higher emissions pathway, historically unprecedented warming is projected during this century. Heat waves are projected to be more intense, while cold waves are projected to be less intense.

Precipitation has been highly variable, with wetter than average conditions over the last decade, and the highest number of extreme events occurred during 2005–2014. Winter and spring precipitation and extreme precipitation events are projected to increase in the future.

Sea level along the New Jersey coast has risen by more than 16 inches, double the global average, since 1911. Global average sea level is projected to rise another 1 to 4 feet by 2100. Sea level rise poses substantial risks, including greater vulnerability to severe coastal flooding.

New Jersey's geographic position in the mid-latitudes often places it near the jet stream, particularly in the late fall, winter, and spring, giving the state its characteristic varied weather. Precipitation is frequent because low-pressure storms associated with the jet stream commonly affect the state. In addition, New Jersey's location on the eastern coast of North America exposes it to the cold winter and warm summer air masses of the continental interior and the moderate and moist air masses of the western Atlantic Ocean. In winter, the contrast between the frigid air masses of the continental interior and the relatively warm Atlantic provides the energy for occasional intense storms known as nor'easters. As a result of these influences, **New Jersey's climate is characterized by moderately cold and occasionally snowy winters and warm, humid summers.** There is a west-to-east contrast of temperatures, with cooler temperatures in the higher elevations of the northwest and warmer temperatures in the east near the coast. Temperature differences from the northwest to southeast are most noticeable in the winter. The northern elevated highlands and valleys experience colder temperatures and more annual average precipitation than the rest of the state. Average minimum temperatures in January range from 15° to 20°F in the northwest to 25° to 30°F along the coast. A similar temperature gradient exists for average maximum temperatures in July—cooler summertime

Observed and Projected Temperature Change

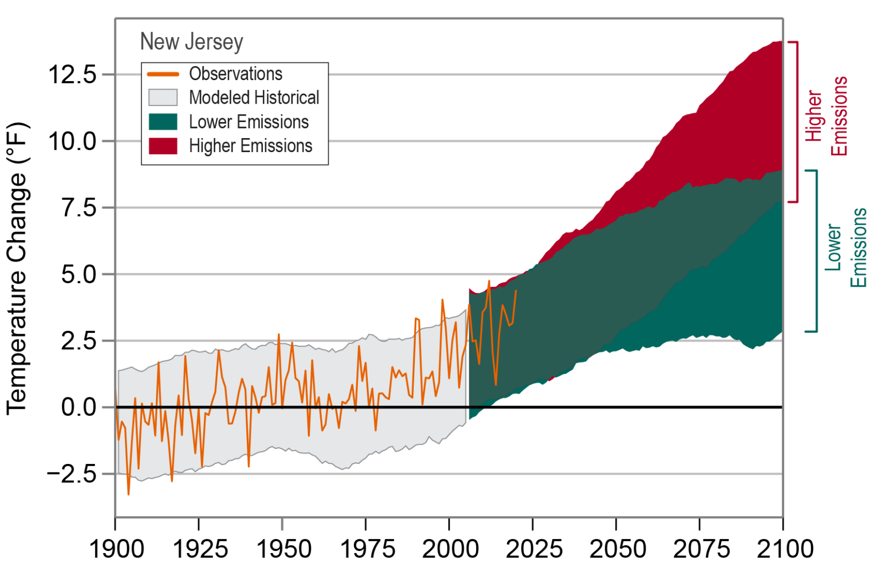


Figure 1: Observed and projected changes (compared to the 1901–1960 average) in near-surface air temperature for New Jersey. Observed data are for 1900–2020. Projected changes for 2006–2100 are from global climate models for two possible futures: one in which greenhouse gas emissions continue to increase (higher emissions) and another in which greenhouse gas emissions increase at a slower rate (lower emissions). Temperatures in New Jersey (orange line) have risen more than 3.5°F since the beginning of the 20th century. Shading indicates the range of annual temperatures from the set of models. Observed temperatures are generally within the envelope of model simulations of the historical period (gray shading). Historically unprecedented warming is projected during this century. Less warming is expected under a lower emissions future (the coldest end-of-century projections being about 2°F warmer than the historical average; green shading) and more warming under a higher emissions future (the hottest end-of-century projections being about 9°F warmer than the hottest year in the historical record; red shading). Sources: CISESS and NOAA NCEI.

temperatures of 80° to 85°F occur in the northwestern corner and temperatures between 85° and 90°F occur in the rest of the state. The statewide annual average precipitation is 47.6 inches. There is a north-south precipitation gradient as well, with the north-central portion of the state averaging around 50 inches of precipitation and the coastal region averaging 40–45 inches.

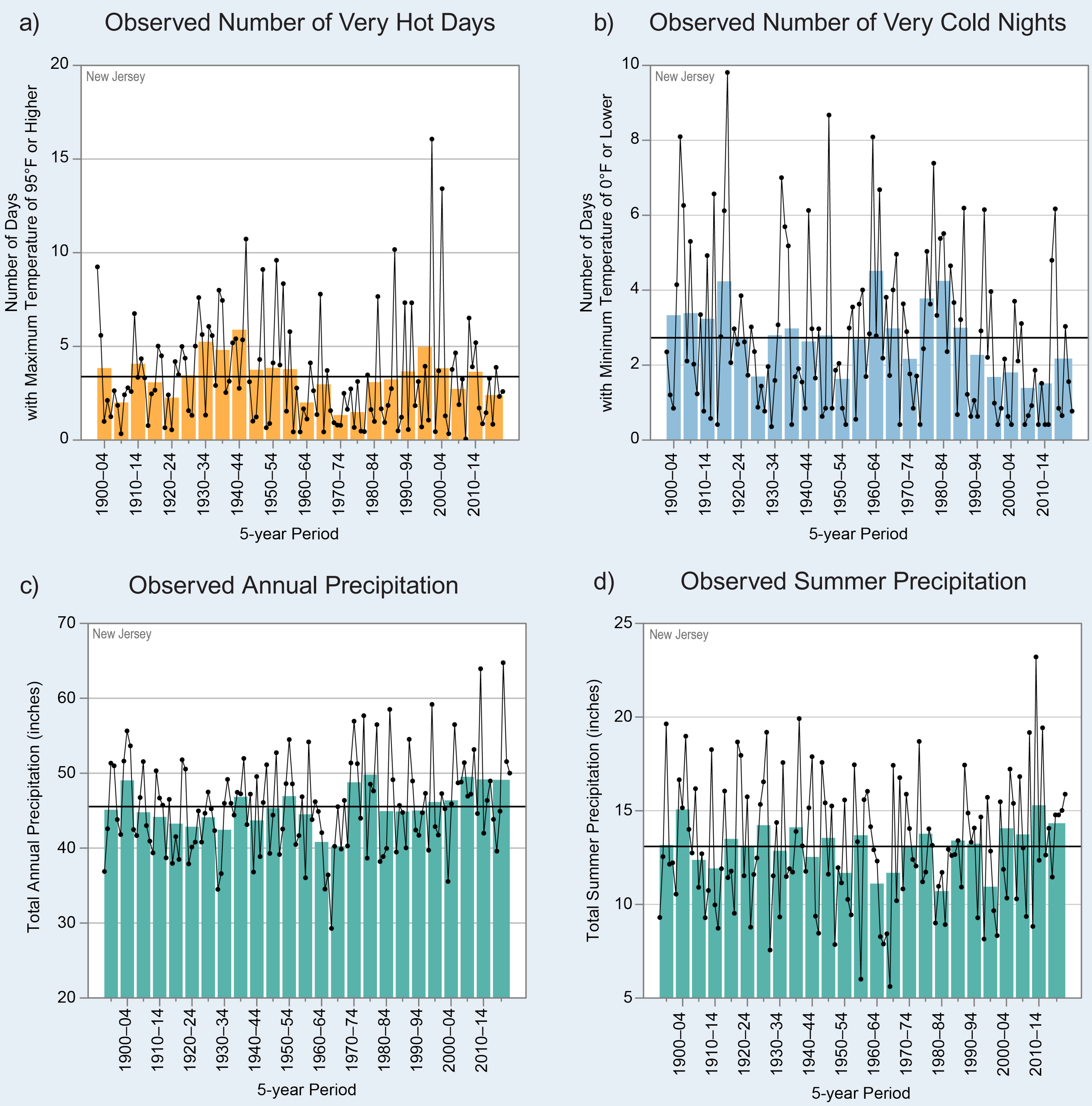


Figure 2: Observed (a) annual number of very hot days (maximum temperature of 95°F or higher); (b) annual number of very cold nights (minimum temperature of 0°F or lower); (c) total annual precipitation; and (d) total summer (June–August) precipitation for New Jersey from (a, b) 1900 to 2020 and (c, d) 1895 to 2020. Dots show annual values. Bars show averages over 5-year periods (last bar is a 6-year average). The horizontal black lines show the long-term (entire period) averages: (a) 3.4 days, (b) 2.7 nights, (c) 45.5 inches, (d) 13.1 inches. Since the late 1980s the number of very hot days has been near to above the long-term average. Very cold nights have been an increasingly rare occurrence since the early 1990s, and this downward trend has extended into this century. Annual and summer precipitation has been above average during the most recent 16 years (2005–2020), with record amounts of summer precipitation occurring between 2010 and 2014. Sources: CISESS and NOAA NCEI. Data: (a, b) GHCN-Daily from 5 long-term stations; (c, d) nClimDiv.

Temperatures in New Jersey have risen more than 3.5°F since the beginning of the 20th century (Figure 1). All of the 10 hottest calendar years on record for the state have occurred since 1990, and six have occurred since 2010. The year 2012 was the warmest on record at 3.0°F above average, and 2020 was the second warmest on record at 2.6°F above average. The number of very hot days has been varied (Figure 2a). The number of warm nights in New Jersey has consistently been above the long-term average since the early 2000s, with the highest 5-year average occurring during the 2010–2014 period (Figure 3). The number of very cold nights has been below average since the early 1990s (Figure 2b). Over the past 25 years, there have been many more unusually warm months than unusually cold months in New Jersey. During the 2000–2020 interval, there were no top 5 coldest months, but there were 38 top 5 warmest months.

Total annual precipitation for New Jersey has been about 3.7 inches above average over the last 16 years (Figure 2c). The driest conditions were in the 1960s, and near normal to wet conditions have occurred since the 1970s. The wettest consecutive 5 years was the 1971–1975 interval, and the driest was the 1962–1966 interval. The number of 2-inch extreme precipitation events was well above average during 2005–2014 but has been slightly below average since then (Figure 4). During 2010–2014, the state experienced the greatest number of 2-inch extreme precipitation events, about 50% above the long-term average. Summer precipitation has been above the long-term average during this century, with the highest 5-year average occurring during the 2010–2014 period (Figure 2d). The state can also experience short-term droughts, such as in 2002, 2010, and 2016–2017.

Extreme weather events typically experienced in the state include coastal nor'easters, snowstorms, spring and summer thunderstorms, flooding rains, heat and cold waves, tropical storms, and on rare occasions, hurricanes. The state's coastline is highly vulnerable to damage from coastal storms, which include nor'easters, tropical storms, and hurricanes. Damaging nor'easters are most common between October and April, and those tracking over or near the coast can bring strong winds and heavy precipitation. **Annually, the state experiences at least one coastal storm, but some years have seen as many as 5 to 10 storm events.** The most

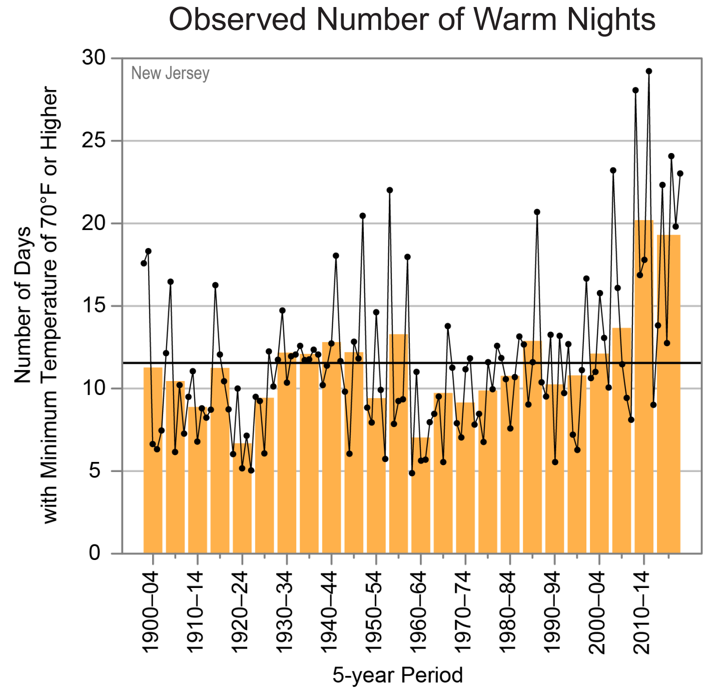


Figure 3: Observed annual number of warm nights (minimum temperature of 70°F or higher) for New Jersey from 1900 to 2020. Dots show annual values. Bars show averages over 5-year periods (last bar is a 6-year average). The horizontal black line shows the long-term (entire period) average of 12 days. The number of warm nights in New Jersey has been above average since 2000, with the highest 5-year average being the 2010–2014 period. Sources: CISESS and NOAA NCEI. Data: GHCN-Daily from 5 long-term stations.

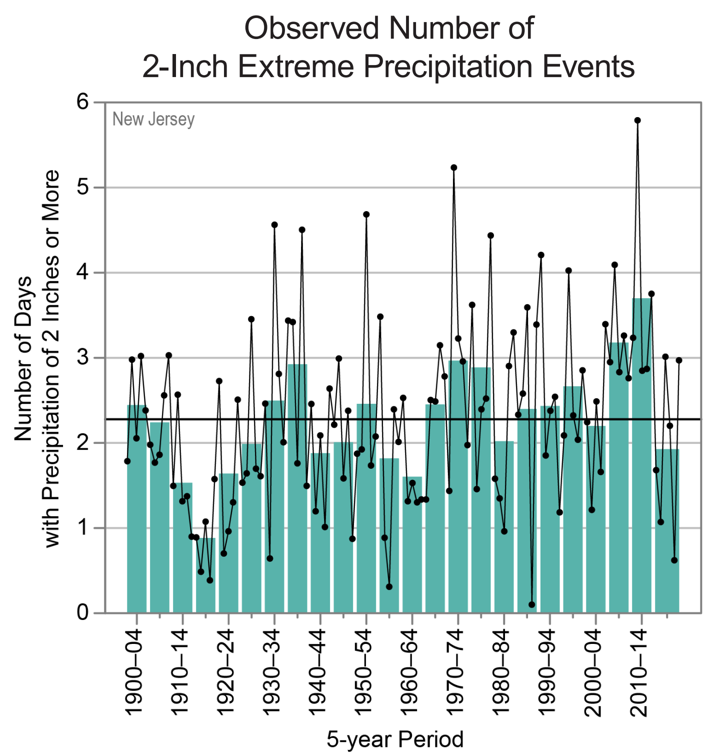


Figure 4: Observed annual number of 2-inch extreme precipitation events for New Jersey from 1900 to 2020. Dots show annual values. Bars show averages over 5-year periods (last bar is a 6-year average). The horizontal black line shows the long-term (entire period) average of 2.3 days. A typical reporting station experiences 2–3 events per year. The number of extreme precipitation events was highest during the 2005–2014 interval. Sources: CISESS and NOAA NCEI. Data: GHCN-Daily from 5 long-term stations.

extreme and destructive event to affect New Jersey in recent years was Superstorm Sandy in 2012. The powerful storm surge, the most destructive element of Sandy, reached 9–10 feet above normal in some areas along the coast. This was caused by strong winds and an unusual west-northwestward track. New Jersey experienced extensive damage from severe winds and coastal flooding, with an estimated $29.4 billion in repair, response, and restoration costs. February 2010 brought three winter storms to the state, causing Atlantic City to have their snowiest month on record. The blizzard of 2016 brought high winds and heavy snow; Bayville, NJ, had gusts of 72 mph and many beaches experienced moderate to major erosion.

Under a higher emissions pathway, historically unprecedented warming is projected during this century (Figure 1). Even under a lower emissions pathway, temperatures are projected to most likely exceed historical record levels by the middle of this century. However, a large range of temperature increases is projected under both pathways, and under the lower pathway, a few projections are only slightly warmer than historical records (Figure 1). Increases in the number of extremely hot days and decreases in the number of extremely cold days are projected to accompany the overall warming. According to a state-level analysis, by the middle of this century an estimated 70% of summers in this region are anticipated to be hotter than what we now recognize as the warmest summer on record.

Winter and spring precipitation and extreme precipitation events are projected to increase in this century (Figure 5). The projections of increasing precipitation and heavy precipitation events are true for a large area of the Northern Hemisphere in the northern middle latitudes. This may result in increased coastal and inland flooding risks throughout the state.

Since 1900, global average sea level has risen by about 7–8 inches. It is projected to rise another 1–8 feet, with a likely range of 1–4 feet, by 2100 as a result of both past and future emissions from human activities (Figure 6). Even greater rises are projected along the New Jersey coast because of land subsidence. Sea level along the coast of New Jersey has also risen faster than the global average. Observations beginning in 1911 show sea level has risen at an average rate of 1.6 inches per decade, about double the global rate, over the period of record at Atlantic City. Sea level rise has caused an increase in tidal floods associated with nuisance-level impacts. Nuisance floods are events in which water levels exceed the local threshold (set by NOAA's National Weather Service) for minor impacts. These events can damage infrastructure, cause road closures, and overwhelm storm drains. As sea level has risen along the New Jersey coastline, the number of tidal flood days (all days exceeding the nuisance-level threshold) has also increased, with the greatest number occurring in 2017 (Figure 7). Coastal flooding caused by sea level rise has important future cross-sector implications for public health, water resources, and coastal ecosystems.

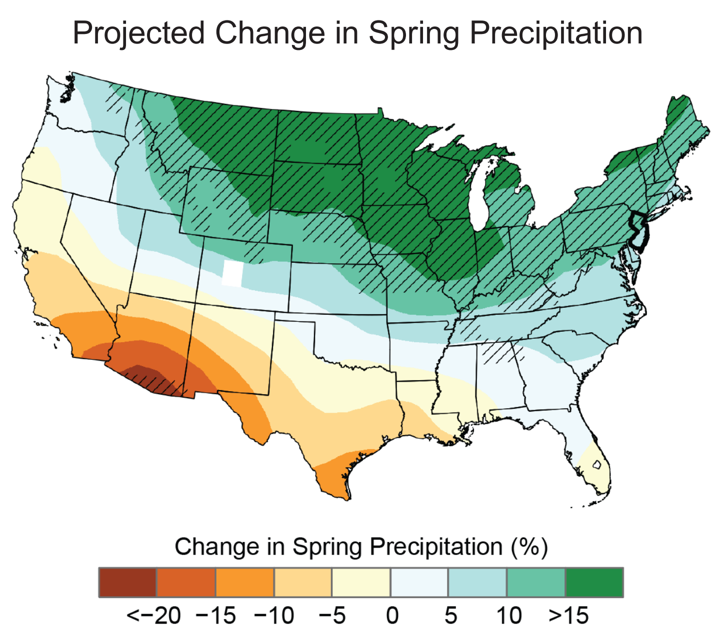


Figure 5: Projected changes in total spring (March–May) precipitation (%) for the middle of the 21st century compared to the late 20th century under a higher emissions pathway. The whited-out area indicates that the climate models are uncertain about the direction of change. Hatching represents areas where the majority of climate models indicate a statistically significant change. New Jersey is part of a large area of projected increases in spring precipitation in the northeastern and central United States. Source: CISESS and NEMAC. Data: CMIP5.

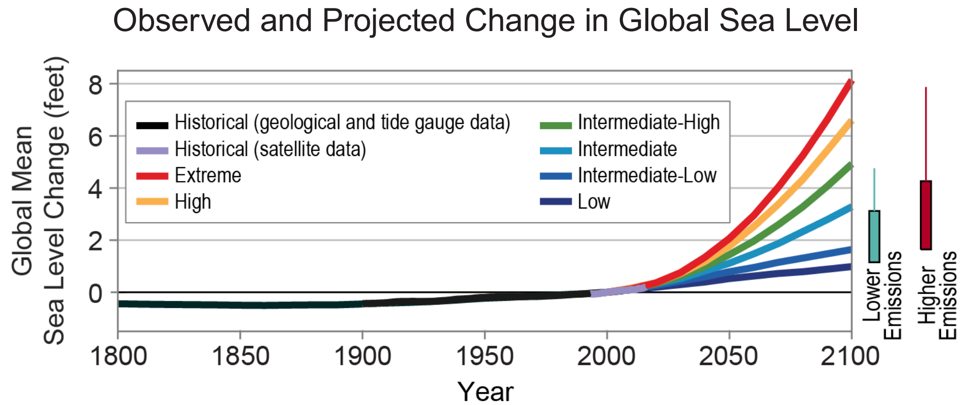


Figure 6: Global mean sea level (GMSL) change from 1800 to 2100. Projections include the six U.S. Interagency Sea Level Rise Task Force GMSL scenarios (Low, navy blue; Intermediate-Low, royal blue; Intermediate, cyan; Intermediate-High, green; High, orange; and Extreme, red curves) relative to historical geological, tide gauge, and satellite altimeter GMSL reconstructions from 1800–2015 (black and magenta lines) and the very likely ranges in 2100 under both lower and higher emissions futures (teal and dark red boxes). Global sea level rise projections range from 1 to 8 feet by 2100, with a likely range of 1 to 4 feet. Source: adapted from Sweet et al. 2017.

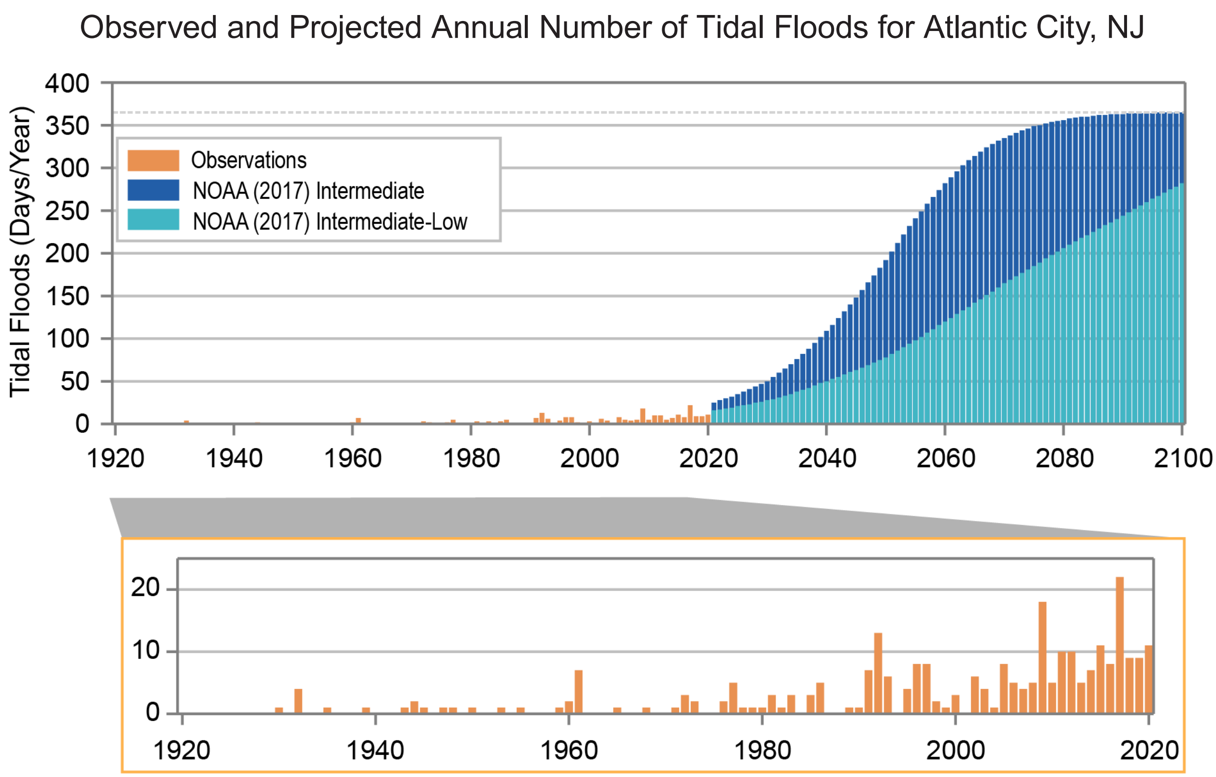


Figure 7: Number of tidal flood days per year at Atlantic City, NJ, for the observed record (1923–2020; orange bars) and projections for 2 NOAA (2017) sea level rise scenarios (2021–2100): Intermediate (dark blue bars) and Intermediate-Low (light blue bars). The NOAA (2017) scenarios are based on local projections of the GMSL scenarios shown in Figure 6. Sea level rise has caused a gradual increase in tidal floods associated with nuisance-level impacts. The greatest number of tidal flood days (all days exceeding the nuisance-level threshold) occurred in 2017 at Atlantic City. Projected increases are large even under a the Intermediate-Low scenario. Under the Intermediate scenario, tidal flooding is projected to occur nearly every day of the year by the end of the century. Additional information on tidal flooding observations and scenarios is available at https://statesummaries.ncics.org/technicaldetails. Sources: CISESS and NOAA NOS.

Technical details on observations and projections are available online at https://statesummaries.ncics.org/technicaldetails.

WWW.NCEI.NOAA.GOV | HTTPS://STATESUMMARIES.NCICS.ORG/CHAPTER/NJ/ | LEAD AUTHORS: JENNIFER RUNKLE, KENNETH E. KUNKEL
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