



# Fifth National Climate Assessment

## Ch. 4 – Water

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Climate change is intensifying the water cycle, with profound effects on the Nation’s water supplies and water-related hazards.

Projected Changes in Maximum Annual Snow Water Equivalent by Midcentury 2036–2065 relative to 1991–2020

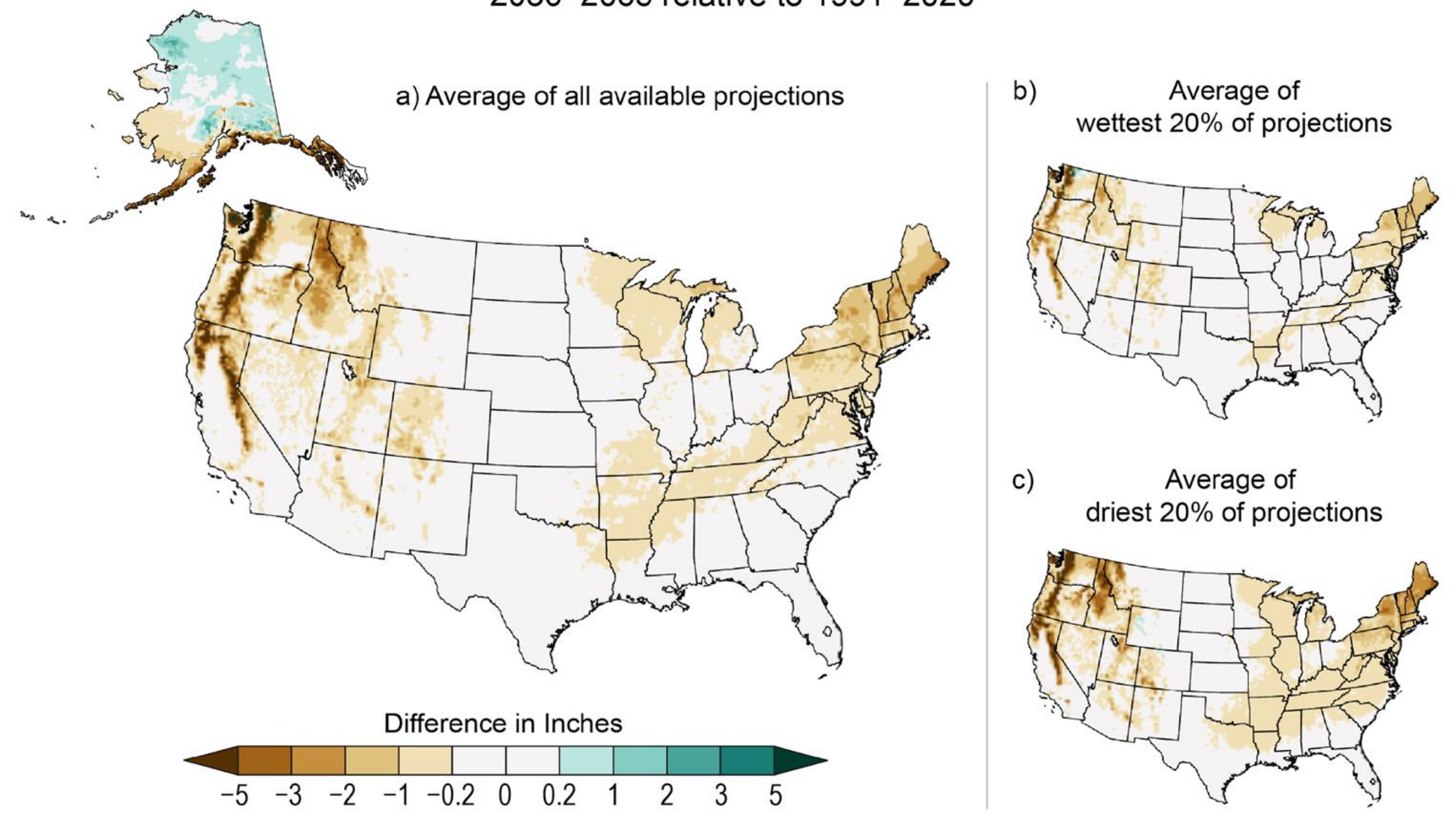


Figure 4.5. Snowpack has been declining and is expected to continue to decline across most of the Nation under the intermediate scenario. Figure credit: University of Colorado Boulder, NOAA NCEI, and CISS NC.

## Background

The chapter begins with an assessment of the trends and projections in components of the water cycle, followed by impacts on water supplies and water-related hazards and how those impacts are distributed across society. It finishes by describing progress and barriers to adaptation.

## What’s New In Chapter 4?

- Discussion of snowpack changes and types of snow drought
- Discussion of how warming degrades water quality
- Inclusion of disproportionate impacts to frontline communities

## Key Message 1

**KM 4.1. Climate Change Will Continue to Cause Profound Changes in the Water Cycle.** Changes to the water cycle pose risks to people and nature. Alaska and northern and eastern regions of the US are seeing and expect to see more precipitation on average, while the Caribbean, Hawai’i, and southwestern regions of the US are seeing and expect to see less precipitation (*medium confidence*). Heavier rainfall events are expected to increase across the Nation (*very likely, very high confidence*), and warming will increase evaporation and plant water use where moisture is not a limiting factor (*medium confidence*). Groundwater supplies are also threatened by warming temperatures that are expected to increase demand (*very likely, high confidence*). Snow cover will decrease and melt earlier (*very likely, high confidence*). Increasing aridity, declining groundwater levels, declining snow cover, and drought threaten freshwater supplies (*medium confidence*).

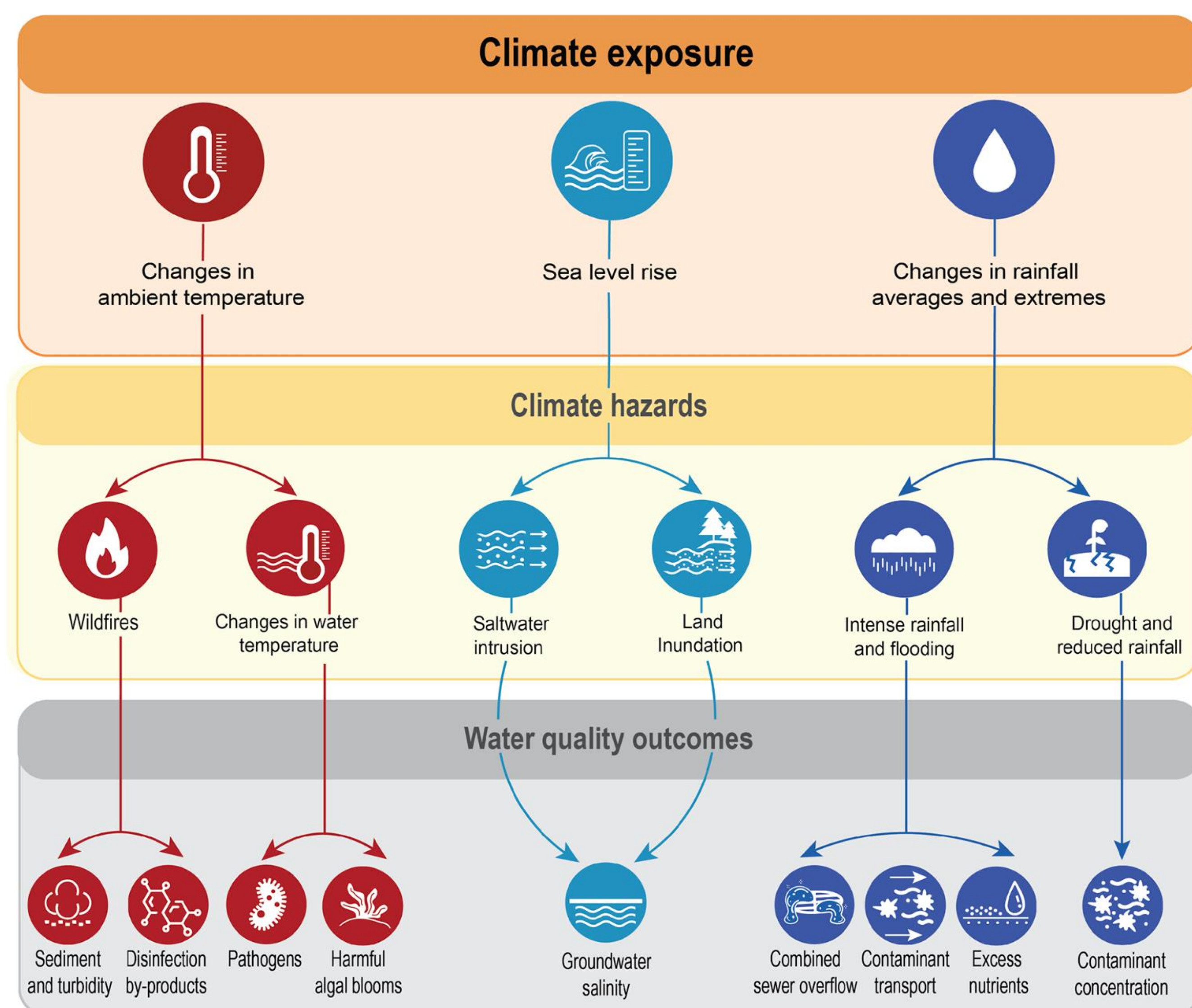


Figure 4.2. Changes in ambient temperature, sea level, and rainfall (top) can create climate-related hazards, such as changes in water temperature and saltwater intrusion (middle) that can have negative impacts on water quality (bottom). Adapted from Nijhawan and Howard 2022.

## Key Message 2

**KM 4.2. Water Cycle Changes Will Affect All Communities, with Disproportionate Impacts for Some.** Natural and human systems have evolved under the water cycle’s historical patterns, making rapid adaptation challenging. Heavier rainfall, combined with changes in land use and other factors such as soil moisture and snow, is leading to increasing flood damage (*likely, high confidence*). Drought impacts are also increasing (*medium confidence*), as are flood- and drought-related water quality impacts (*medium confidence*). All communities will be affected, but in particular those on the frontline of climate change—including many Black, Hispanic, Tribal, Indigenous, and socioeconomically disadvantaged communities—face growing risks from changes to water quantity and quality due to the proximity of their homes and workplaces to hazards and limited access to resources and infrastructure (*very likely, high confidence*).

Residential Flooding from Hurricane Harvey

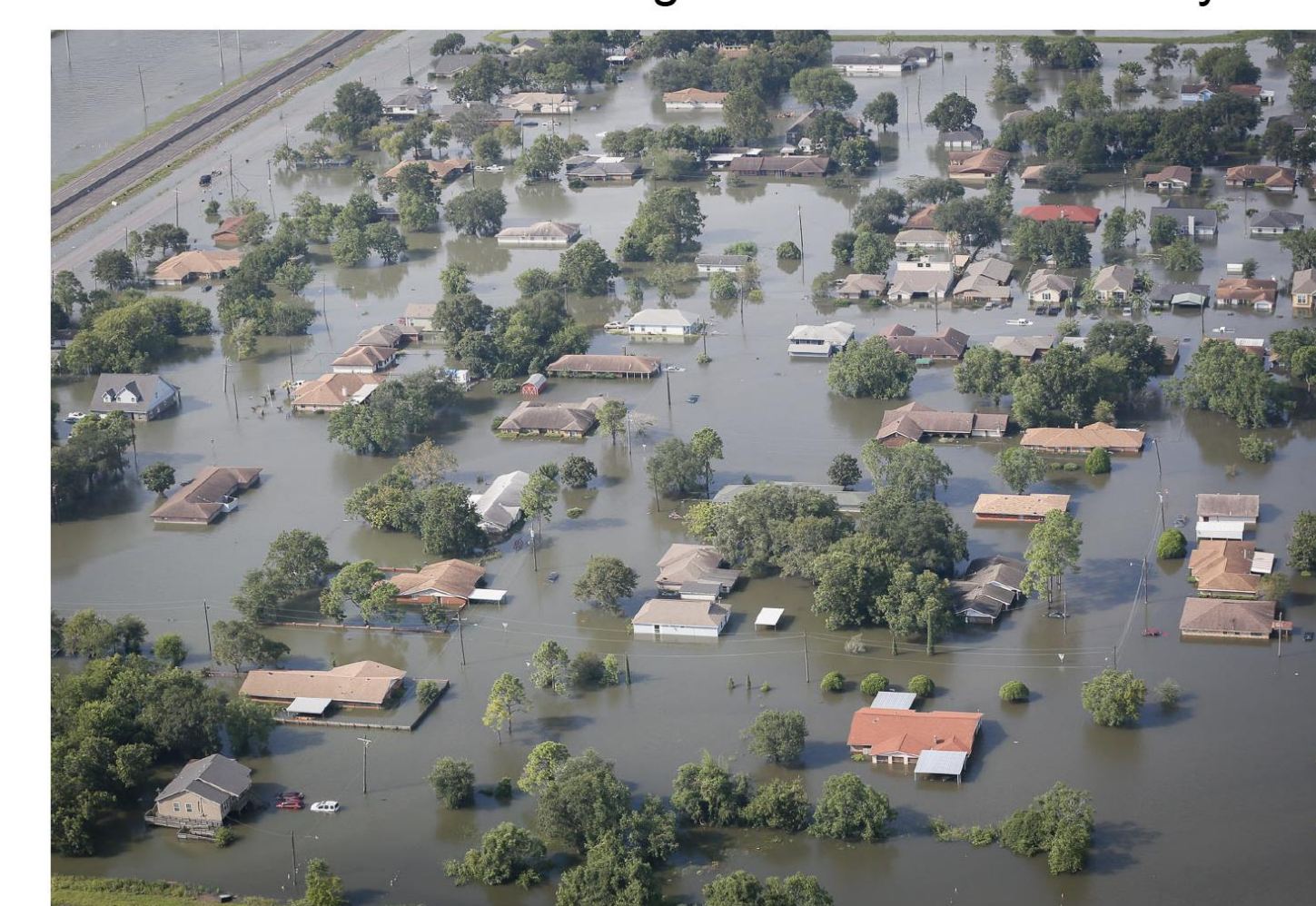


Figure 4.15. Inundated residential neighborhoods in Port Arthur, Texas. Photo credit: Staff Sgt. Daniel J. Martinez, US Air National Guard.

## Key Message 3

**KM 4.3. Progress Toward Adaptation Has Been Uneven.** The ability of water managers to adapt to changes has improved with better data, advances in decision-making, and steps toward cooperation. However, infrastructure standards and water allocation institutions have been slow to adapt to a changing climate (*high confidence*), and efforts are confounded by wet and dry cycles driven by natural climate variability (*very likely, high confidence*). Frontline, Tribal, and Indigenous communities are heavily impacted but lack resources to adapt effectively, and they are not fully represented in decision-making (*high confidence*).

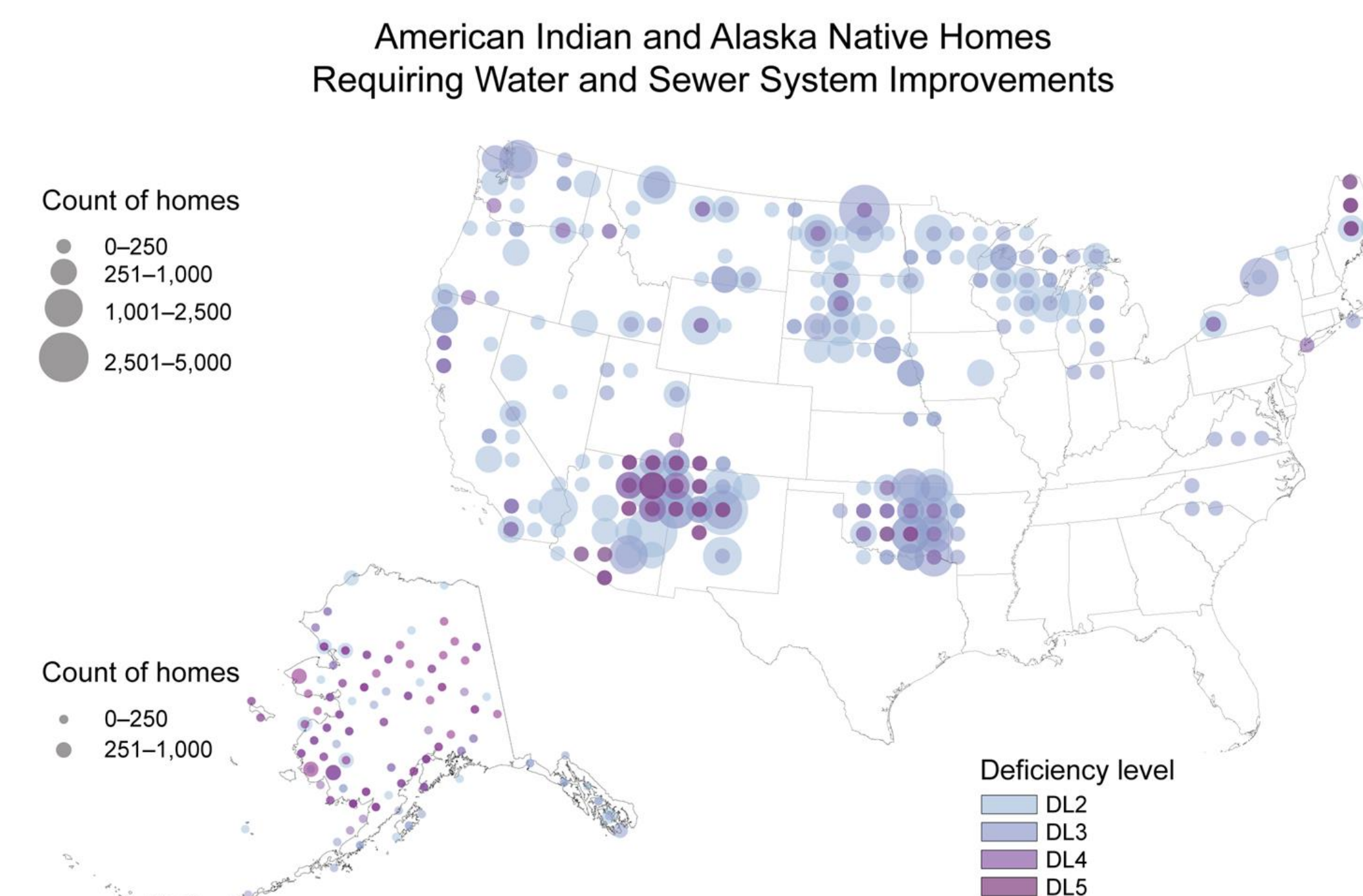


Figure 4.16. American Indian and Alaska Native homes requiring sanitation improvements ranging from level 2 (capital improvements are necessary to meet domestic sanitation needs) to level 5 (lacks a safe water supply and sewage system). Figure credit: Indian Health Service.



Read the full chapter here