

# 2014 National Climate Assessment: Climate Change Impacts in the United States

## CHAPTER 3 WATER RESOURCES

### KEY MESSAGES

#### *Climate Change Impacts on the Water Cycle*

1. Annual precipitation and river-flow increases are observed now in the Midwest and the Northeast regions. Very heavy precipitation events have increased nationally and are projected to increase in all regions. The length of dry spells is projected to increase in most areas, especially the southern and northwestern portions of the contiguous United States.
2. Short-term (seasonal or shorter) droughts are expected to intensify in most U.S. regions. Longer-term droughts are expected to intensify in large areas of the Southwest, southern Great Plains, and Southeast.
3. Flooding may intensify in many U.S. regions, even in areas where total precipitation is projected to decline.
4. Climate change is expected to affect water demand, groundwater withdrawals, and aquifer recharge, reducing groundwater availability in some areas.
5. Sea level rise, storms and storm surges, and changes in surface and groundwater use patterns are expected to compromise the sustainability of coastal freshwater aquifers and wetlands.
6. Increasing air and water temperatures, more intense precipitation and runoff, and intensifying droughts can decrease river and lake water quality in many ways, including increases in sediment, nitrogen, and other pollutant loads.

#### *Climate Change Impacts on Water Resources Use and Management*

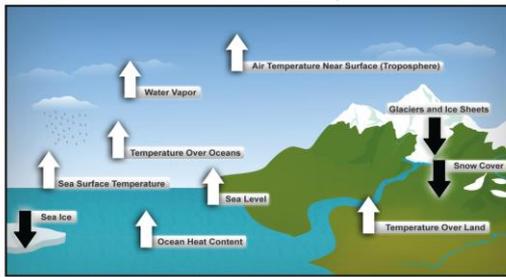
7. Climate change affects water demand and the ways water is used within and across regions and economic sectors. The Southwest, Great Plains, and Southeast are particularly vulnerable to changes in water supply and demand.
8. Changes in precipitation and runoff, combined with changes in consumption and withdrawal, have reduced surface and groundwater supplies in many areas. These trends are expected to continue, increasing the likelihood of water shortages for many uses.
9. Increasing flooding risk affects human safety and health, property, infrastructure, economies, and ecology in many basins across the United States.

#### *Adaptation and Institutional Responses*

10. In most U.S. regions, water resources managers and planners will encounter new risks, vulnerabilities, and opportunities that may not be properly managed within existing practices.
11. Increasing resilience and enhancing adaptive capacity provide opportunities to strengthen water resources management and plan for climate change impacts. Many institutional, scientific, economic, and political barriers present challenges to implementing adaptive strategies.

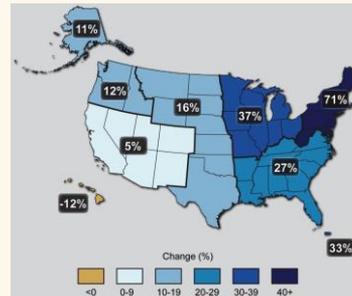
NCA 2014: Climate Change Indicators

Ten Indicators of a Warming World



NCA 2014 Report Findings

Extreme weather: Some extreme weather and climate events have increased in recent decades, and

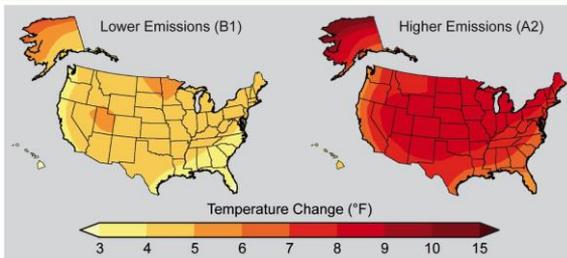


new and stronger evidence confirms that many of these increases are related to human activities.

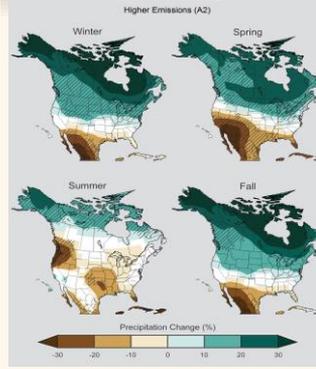
**Observed Change in Very Heavy Precipitation**

NCA 2014 Report Findings

Future climate: Human-induced climate change is projected to continue, and it will accelerate significantly if global emissions of heat-trapping gases continue to increase.



NCA 2014: Impacts on the Southwest



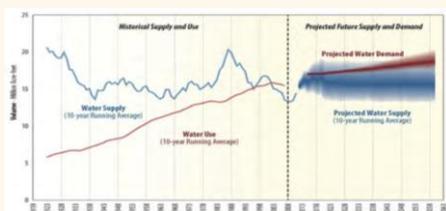
The Southwestern US is expected to get dryer as well as warmer...

The wet areas will get wetter, The dry areas will get drier... But the seasonal effects are different.

Projected Precipitation by Season (CMIP 5)

NCA 2014: Reduced Snowpack and Streamflows

Snowpack and streamflow amounts are projected to decline in parts of the Southwest, decreasing surface water supply reliability for cities, agriculture, and ecosystems.



Historical and Projected Water Supply and Demand for the Colorado River Basin

Impacts of Climate Change on Water Cycle

- Less supply/storage from snow melt
  - Higher % of precipitation as rain vs snow
  - Earlier melt and peak flows
- Loss of reservoir storage
  - Evaporation and sedimentation
  - Dam operating constraints (e.g., flood control)
- More extreme events, both floods and droughts
- Serious implications for aquatic ecosystems, including water quality
- Higher ET
- Cascading effects

