

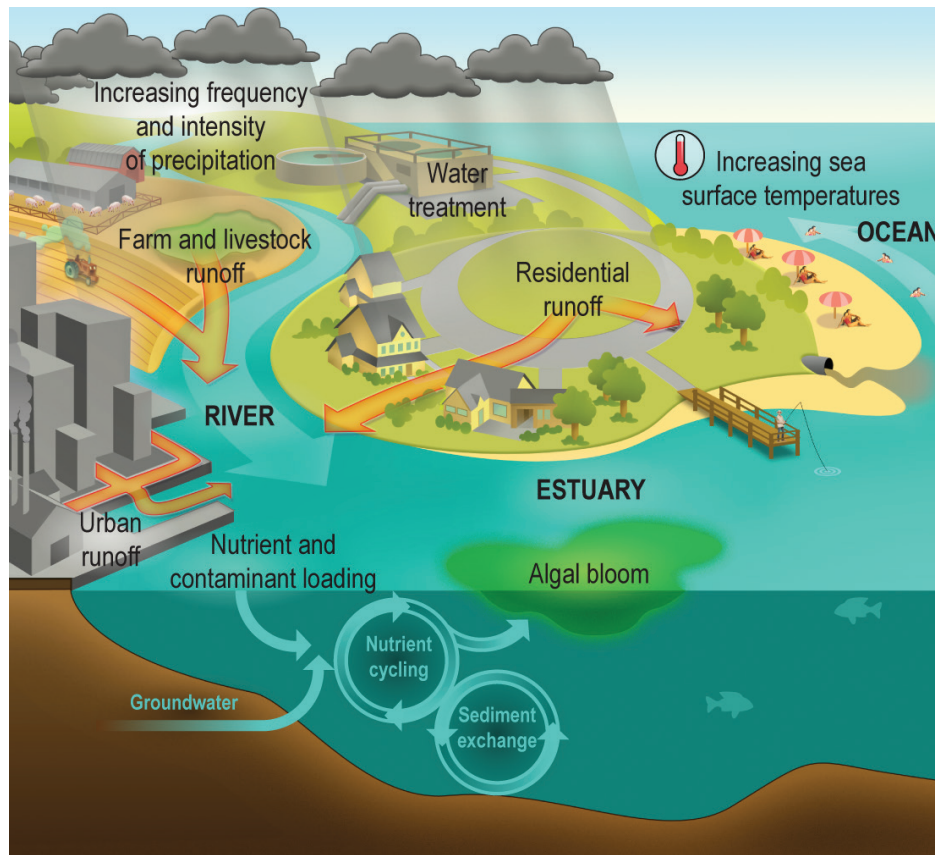


CLIMATE IMPACTS ON WATER-RELATED ILLNESSES

Across most of the United States, climate change is expected to affect fresh and marine water resources in ways that will increase people's exposure to water-related contaminants that cause illness. Water-related illnesses include waterborne diseases caused by pathogens, such as bacteria, viruses, and protozoa. Water-related illnesses are also caused by toxins produced by certain harmful algae and cyanobacteria and by chemicals introduced into the environment by human activities. Exposure occurs through ingestion, inhalation, or direct contact with contaminated drinking or recreational water and through consumption of contaminated fish and shellfish. Factors related to climate change—including temperature, precipitation and related runoff, hurricanes,

and storm surge—affect the growth, survival, spread, and virulence or toxicity of agents (causes) of water-related illness. Whether or not illness results from exposure to contaminated water, fish, or shellfish is dependent on a complex set of factors, including human behavior and social determinants of health that may affect a person's exposure, sensitivity, and adaptive capacity. Water resource, public health, and environmental agencies in the United States provide many public health safeguards to reduce risk of exposure and illness even if water becomes contaminated. These include water quality monitoring, drinking water treatment standards and practices, beach closures, and issuing advisories for boiling drinking water and harvesting shellfish.

Links between Climate Change, Water Quantity and Quality, and Human Exposure to Water-Related Illness



Precipitation and temperature changes affect fresh and marine water quantity and quality primarily through urban, rural, and agriculture runoff. This runoff in turn affects human exposure to water-related illnesses primarily through contamination of drinking water, recreational water, and fish or shellfish (see Ch. 6: Water-Related Illness).



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Red tide bloom, Hood Canal, Puget Sound, Washington State.

Seasonal and Geographic Changes in Waterborne Illness Risk

Key Finding 1: Increases in water temperatures associated with climate change will alter the seasonal windows of growth and the geographic range of suitable habitat for freshwater toxin-producing harmful algae [*Very Likely, High Confidence*], certain naturally occurring *Vibrio* bacteria [*Very Likely, Medium Confidence*], and marine toxin-producing harmful algae [*Likely, Medium Confidence*]. These changes will increase the risk of exposure to waterborne pathogens and algal toxins that can cause a variety of illnesses [*Medium Confidence*].

Runoff from Extreme Precipitation Increases Exposure Risk

Key Finding 2: Runoff from more frequent and intense extreme precipitation events will increasingly compromise recreational waters, shellfish harvesting waters, and sources of drinking water through increased introduction of pathogens and prevalence of toxic algal blooms [*High Confidence*]. As a result, the risk of human exposure to agents of water-related illness will increase [*Medium Confidence*].

Water Infrastructure Failure

Key Finding 3: Increases in some extreme weather events and storm surges will increase the risk that infrastructure for drinking water, wastewater, and stormwater will fail due to either damage or exceedance of system capacity, especially in areas with aging infrastructure [*High Confidence*]. As a result, the risk of exposure to water-related pathogens, chemicals, and algal toxins will increase in recreational and shellfish harvesting waters, and in drinking water where treatment barriers break down [*Medium Confidence*].



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Young women walk through floodwater in the historic district of Charleston, South Carolina, as Hurricane Joaquin passes offshore. October 4, 2015.

