Union of Concerned Scientists

FACT SHEET

Confronting Climate Change in Washington

Current Impacts and Future Risks

HIGHLIGHTS

Climate change is already being felt in the Evergreen State as record-breaking wildfires destroy communities and forests, shellfish hatcheries fail because of an acidifying ocean, and declining snowpack and earlier snowmelt in the mountains jeopardize summer water supplies.

Climate models project temperatures in the Pacific Northwest could increase by between 5°F and 8.5°F over today's level by the end of this century, depending on the rate at which we continue to generate heat-trapping gases.

Global warming represents a severe challenge to Washington's way of life. But this challenge can be met if residents, businesses, and policymakers act swiftly to reduce the state's climate footprint. From cleaner electricity to cleaner fuels, there are many options for reducing emissions in the Evergreen State.

From the Olympic Peninsula to the Palouse hills, Washington is a landscape of powerful rivers, dense evergreen forests, rugged mountains, and farmland. Washington's diverse landscapes sustain the state's economically vital fishing industries, timber trade, and agriculture, as well as a vibrant tourism industry that contributes more than $21 billion annually to the state's economy (WSDC 2018). The state's unique ecology nourishes 3,000 miles of marine shoreline, temperate rain forests, and majestic mountain ranges. This thriving economy and complex ecology are also vulnerable to a warming climate.

Washington residents, like people across the country, are seeing and feeling impacts from global warming resulting from the buildup of heat-trapping emissions in the atmosphere. The average annual temperature in the Pacific Northwest has warmed by at least 1.5°F since the first half of the 20th century, and winter minimum temperatures have warmed by more than 4.5°F (Vose et al. 2017). Record-breaking wildfires are destroying forests and communities, shellfish hatcheries are failing because of an acidifying ocean, and declining snowpack and earlier snowmelt in the mountains are jeopardizing summer water supplies.

Unless Washington—and the broader global community—makes deep and swift cuts in heat-trapping emissions, future changes to our climate could be dramatic. Climate models project that Pacific Northwest temperatures could increase by between 5°F and 8.5°F over today's level by the end of the century, depending on the rate at which we continue to emit heat-trapping gases (Vose et al. 2017; Sanford et al. 2014). In the next 20 to 50 years alone, heat waves are projected to become hotter by as much as 12°F (Vose et al. 2017).

Benjamin Drummond/bdsjs.com

Ocean acidification, driven by absorption of carbon dioxide from the burning of fossil fuels, is responsible for declines in the production of Washington's oyster farms, putting the state's $270 million shellfish industry at risk.

The Changing Ocean

Sea level is rising along most of Washington's coast, and the coastal ocean has become more acidic as it absorbs carbon dioxide from the atmosphere. These changes, driven by an increase in carbon emissions generated largely by the burning of fossil fuels, pose major threats to the area's habitat and coastal infrastructure as well as to the people and industries that depend on it.

BOX 1.

Washington's Threatened Oyster Farms

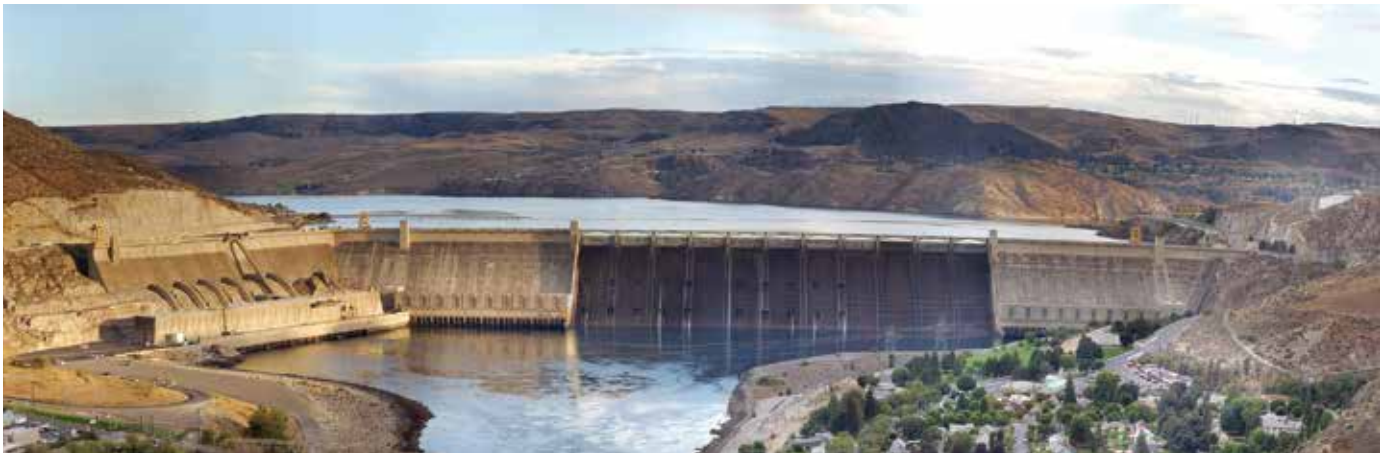
Ocean acidification is responsible for declines in hatchery production in Washington's Pacific inlets, posing a major threat to the state's shellfish industry. The problem was first recognized in 2005, when scientists confirmed that greater ocean acidity was to blame for softening oysters' shells. Now Washington oyster farmers are trying to adapt to the corrosive waters by adding large quantities of alkaline chemicals to their oyster hatcheries. At stake is a $270 million shellfish industry that produces one-quarter of the nation's oysters and supports 3,200 jobs. More broadly, climate change will affect Washington's entire seafood industry, which generates more than 42,000 jobs and contributes at least $1.7 billion to Washington's economy (WSDE 2012).

Sea level rise from human emissions of heat-trapping gases could put more than 7,000 coastal residential properties in the state of Washington—valued at more than $2 billion today—at risk of chronic inundation within the next 30 years (Dahl et al. 2018). Rising seas increase the likelihood of permanent inundation of low-lying areas, higher tidal and storm surge reach, river flooding, erosion, and loss of wildlife habitat (Snover et al. 2013). Sea level in Seattle has already risen eight inches over the last 100 years (NOAA n.d.). It could rise by another 1 to 10 feet over the next 100 years, depending on our emissions choices and the stability of our polar ice sheets (Sweet et al. 2017).

Approximately 40 percent of human-produced carbon dioxide released into the atmosphere since the start of the industrial era is now dissolved in the ocean (DeVries, Holzer, and Primeau 2017). Faster-than-expected ocean acidification has become a serious concern in the Northwest (Feely et al. 2012). High-acidity water is corrosive to shell-forming organisms, and continued acidification could alter the marine food web, threatening culturally and commercially significant marine species such as oysters (see Box 1) and Pacific salmon (Mote el al. 2014).

Diminishing and Uncertain Water Supplies

Winter snow accumulation in the mountains provides a natural water storage system that Washington relies on during its drier summer months for water supplies as well as for hydroelectricity generation. Parts of Washington have experienced a more than 70 percent decrease in snowpack since the early 20th century (Mote et al. 2018). Declines in snowpack are projected to continue as more winter precipitation falls as rain rather than snow throughout much of the Pacific Northwest (Wehner et al. 2017).



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The heavy runoff from the high elevations of the Cascade Range in the late spring and summer makes it possible for Washington to generate vast quantities of hydroelectric power. Even modest changes in winter temperatures reduce opportunities for hydropower generation.

Matt Castle/USFS

Scientific evidence shows that climate change is producing hotter, drier conditions that contribute to a heightened risk of wildfires in the American West.

In addition, the timing of the snowmelt could shift and become out of sync with communities' needs. Snow is already melting as many as 30 days earlier than in the mid-20th century, reducing summer stream flows in many Northwest snow-fed rivers (Fritze, Stewart, and Pebesma 2011). This means that less water is available during the hotter months when water demand tends to be highest. At the same time, earlier snowmelt and increased precipitation in the form of rain can pose flooding risks in the late winter and early spring.

Earlier snowmelt also means that Washington's production of hydroelectric power could fail to peak when power demand peaks. Washington is the largest producer of hydroelectric power in the nation, and this abundant resource supplies 70 percent of the state's electricity (EIA n.d.). A change in the timing of water supplies could reduce electricity generation from hydroelectric dams in the late spring and summer when stream flows are reduced (Mote et al. 2014). These changes may also complicate reservoir and irrigation management and stress freshwater fish, particularly salmon and trout (Dalton, Mote, and Snover 2013; Mantua, Tohver, and Hamlet 2010). And changes to the water supply could interfere with recreational activities such as fishing, rafting, and kayaking.

Greater Risk of Wildfires and Forest Damage

Forests are an essential part of Washington; they are what make it the Evergreen State. Forests cover half of the land of Washington state, and play a significant role in the state economy, supporting local communities with around 105,000 forestry-related jobs and generating approximately $28 billion in gross business income in 2014 (WSDC n.d.).

Forest mortality due to fire is already rising in Washington (Abatzoglou and Williams 2016). The frequency and intensity of wildfires, as well as the costs to fight them, are growing. In 2015, the Pacific Northwest experienced the most severe fires on record. In Washington that year, more than 1 million acres burned, re-breaking records set just one year earlier. The destructive and deadly 2015 fires (see Box 2) were partly fueled by long-term drought and temperatures that were then the warmest on record across much of Washington (USDA 2016). In 2017, the Pacific Northwest again broke records for summer temperatures (USFS and BLM 2018). Land management, fire suppression strategies, and changes in forest type will play a large role in the future of fire in the Pacific Northwest (Mote et al. 2014). But continuing warmer and drier summer conditions could quadruple the typical annual area burned by fire in the Northwest by the 2080s (Littell et al. 2010).

In the coming decades, warmer temperatures, declining snowpack, and changes in soil moisture are expected to lead to a long-term transformation of the state's forest landscapes. Climate models show that the area of severely water-limited forests is projected to increase by almost 50 percent by mid-century (Littell et al. 2010). This will make drought-stressed forests more susceptible to outbreaks of pests such as the highly destructive mountain pine beetle, which is already

BOX 2.

Destructive Wildfire Destroys Homes

In August 2015, Washington's largest-ever wildfire, the Okanagan Complex Fire, scorched more than 550 square miles, destroyed 195 structures, and incurred more than $60 million in damage. Washington's wildfires have continued to break records since, and the incidence of highly destructive wildfires is projected to rise steeply in the western United States as temperatures continue to warm.

causing forest mortality in the state (Preisler et al. 2012). Projected wintertime warming of 7°F by the end of the century in the Pacific Northwest could further intensify pine beetle outbreaks, as it becomes easier for pest populations to survive year-round (Vose et al. 2017; Preisler et al. 2012).

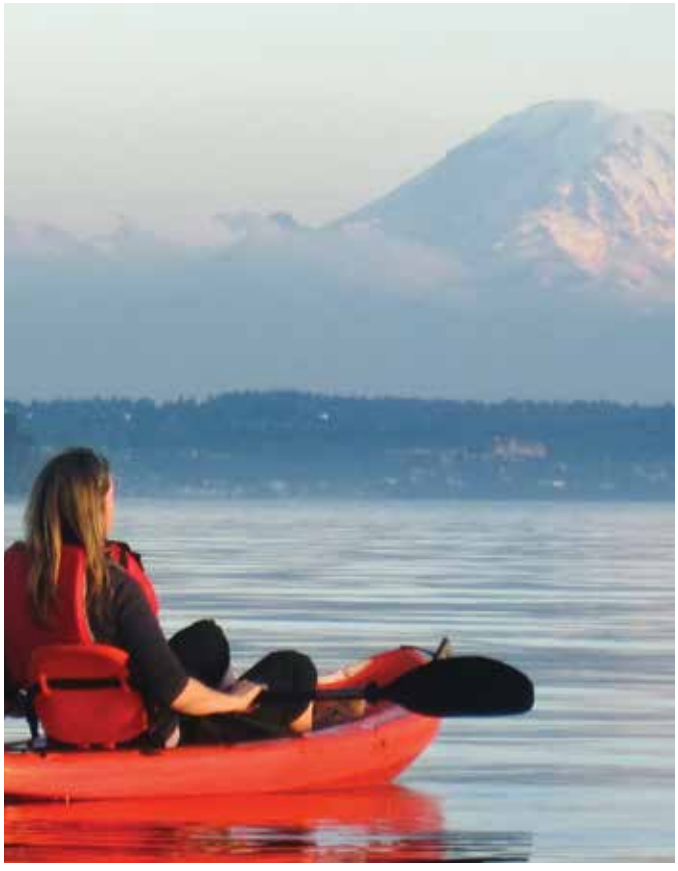
Climate Solutions in Washington

Global warming represents a severe challenge to Washington's way of life, but the challenge can be addressed if policymakers, businesses, and residents take swift action and work together—both in reducing emissions and responding to the changes already occurring.

Efforts are under way by the state, local governments, and native tribes to identify actions to build more climate-resilient communities (US Federal Government 2014). At the same time, the emissions choices made today—in Washington and throughout the world—will shape the climate our children and grandchildren inherit. Other states and regions have pioneered successful strategies for reducing emissions as their economies grow and new industries are created. Washington has made a start, but more can be done to meet this important challenge.

The state has set goals for reducing heat-trapping emissions, and has many options for reducing emissions and contributing to national and global efforts to limit the worst consequences of climate change. The state could:

- Establish a price on carbon emissions that levels the playing field for clean energy and generates revenues that could be used for the public good
- Enact policies to encourage cleaner fuels for transportation, including sustainable biofuels and low-carbon electricity, thereby reducing dependence on fossil fuels
- Increase the use of zero-carbon sources of electricity such as wind and solar, reduce reliance on polluting sources such as coal and natural gas, and work toward achieving a net zero-emissions energy sector by mid-century
- Expand the market for electric vehicles by extending consumer purchase incentives and expanding charging infrastructure, and join other states in requiring automakers to produce advanced-technology vehicles
- Improve energy efficiency in commercial and residential buildings, agriculture, and industry



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Washington's diverse landscapes sustain the state's economically vital fishing industries, timber trade, and agriculture, as well as a vibrant tourism industry that contributes more than $21 billion annually to the state's economy. Climate change represents a severe challenge to Washington's way of life. But this challenge can be met if residents, businesses, and policymakers act swiftly.

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