

# NATIONAL PARKS IN PERIL

## THE THREATS OF CLIMATE DISRUPTION

### State Fact Sheet: Maryland and Virginia

Human disruption of the climate is the greatest threat ever to our national parks.

At risk are nearly every resource and value that make our national parks so special. In *National Parks in Peril*, the Rocky Mountain Climate Organization and the Natural Resources Defense Council identify 25 national parks as having the greatest vulnerabilities to human-caused climate change. In Maryland and Virginia, **Assateague Island National Seashore** and **Colonial National Historical Park** are on the list of most endangered parks. **Assateague Island** is vulnerable to higher seas and more storms, more downpours and floods, a loss of plant communities, a loss of wildlife, more crowding, a loss of fishing, and more air pollution. **Colonial** is vulnerable to higher seas and more storms, more downpours and floods, and a loss of cultural resources. **Shenandoah National Park** faces similar vulnerabilities.

Many of these impacts are already happening, as human activities—the emission of heat-trapping gases—are now changing the climate. To preserve our national parks for ourselves and future generations, we need to both stop changing the climate and take actions to preserve the resources and values that make our parks special. For detailed recommendations, see the full report, *National Parks in Peril*.

#### Higher Seas and Stronger Storms

A hotter climate raises sea levels by melting ice from land-based glaciers and ice sheets, which adds more water to the oceans, and by heating water so that it expands in volume, which also pushes sea levels higher. Current estimates are that with a high-emissions future sea level will rise three to four more feet by the end of the century; under a lower-emissions future, the seas are expected to rise about 2.3 feet. A second major risk to coasts and coastal parks comes from stronger coastal storms, including hurricanes. According to a recent U.S. government report, climate models project that further warming of ocean waters will lead to stronger tropical storms.



To read the full report on the impacts of global warming on national parks, visit [www.nrdc.org/policy](http://www.nrdc.org/policy) or [www.rockymountainclimate.org](http://www.rockymountainclimate.org)

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In a recent report, the U.S. government says that a substantial portion of Assateague Island, having been breached and segmented by recent sea-level rise and storms, may already be at a threshold of permanent geological change. With any increase in the current rate of sea-level rise, it is “virtually certain” that the island will experience large changes and degradation. With even a modest increase of an additional inch of sea-level rise every dozen years, it is “very likely”—at least a two-thirds chance—that the seashore will be broken into separate segments.

Assateague Island is in the area experiencing the fastest rate of sea-level rise along the Atlantic coast, and one of the fastest in the nation. At Ocean City, Maryland, just across a narrow inlet from the northern end of the seashore, the sea-level rise has been the second fastest measured so far along the Atlantic, at a rate of 1.80 feet per century. The only spot with a faster measured rate (1.98 feet per century) is the next station to the south, at the Chesapeake Bay Bridge-Tunnel, about 60 miles to the south of the seashore's southern end.

## **More Downpours and Floods**

With a changed climate, more precipitation now comes in downpours. The amount of rain falling in heavy storms increased by 20 percent over the past century, while there has been little change in the amount from light and moderate storms. In its recent report, the U.S. Global Change Research Program says there is at least a 90 percent likelihood that heavy downpours will become even more frequent and intense. With an increase in downpours, flooding also is likely to increase. Virtually all national parks in Maryland, Virginia, and elsewhere are at risk, as the forecast is for more downpours everywhere. An extreme downpour in Mount Rainier National Park in 2006 illustrates the risk—it caused so much flooding that the entire park was closed for a full six months.

## **Loss of Plant Communities**

An altered climate can lead to fundamental changes in the natural plant communities of parks. At Assateague Island, the plant communities of the coastal dune ecosystems and marshes, intertidal areas, and near-shore ecosystems could be lost to the effects of sea-level rise, stronger coastal storms, storm surges, and saltwater intrusion, all of which are projected to result from a human-changed climate.

## **Loss of Wildlife**

For many Americans, the highlight of a trip to a national park is the wildlife they see. But a changed climate could mean less of the wildlife species now in the parks. Some species may go completely extinct, and, local populations in particular parks may be eliminated or decline sharply.

The beaches of Assateague Island provide nesting habitat for sea turtles, but the seashore is vulnerable to sea-level rise and stronger storms, and as a result so are the sea turtles.

Butterflies are particularly sensitive to temperature and so are vulnerable to a changed climate. Monarch butterflies illustrate the risks. They make one of the most amazing migrations of all wildlife, taking several generations to complete a round trip thousands of miles long to return to particular wintering grounds. Scientists do not even know how the great-great-great grandchildren find the winter roosting sites. But scientists do project that an altered climate will make the wintering grounds wetter, causing problems for the monarchs, which cannot survive occasional freezing temperatures if they are wet. Monarchs migrate through and to all 48 contiguous states. If their populations drop, though, that would be felt particularly at Assateague Island. Many monarchs migrate along the coast in the fall; Assateague Island is adjacent to a national wildlife refuge where a monitoring project has recorded as many as 243 monarchs per hour in a peak migration year.

An altered climate is likely to reduce inland populations of cold-water fish species, including trout. For trout a hotter climate is the single greatest threat to their survival; when water temperatures reach the mid-70°s, trout can die. Trout populations in Shenandoah could be affected.

## **Loss of Historical and Cultural Resources**

By preserving some of the best of our historical and cultural resources—buildings, landscapes, archaeological sites, and artifacts—America’s national parks provide information about the past and provide important links to the present. Many of these resources are at risk from the possible effects of a climate disrupted by human activities.

Vulnerable is where the first European ancestors of today’s Americans arrived in 1607, the Jamestown National Historic Site, which is part of Colonial. The original fort built by the first settlers was thought for over two centuries to have been lost to erosion of the riverbank of the James River. The fort’s original location, however, was recently rediscovered and much of it is being successfully excavated. Other parts of the fort, though, are now known to have been definitely lost to erosion of the riverbank. In this tidal stretch of the James River, the remainder of the fort continues to be at risk to rising seas (which in the Chesapeake Bay area are rising at twice the global average rate), storms, and storm surges. Already, in 2003, Hurricane Isabel flooded 90 percent of the park’s one million artifacts, leading the NPS to relocate the entire collection to another facility for restoration.

## **More Overcrowding**

As temperatures soar with a changed climate, to escape oppressive heat enough people may flock to cooler national seashores to overcrowd them. In these parks, the impacts of additional visitation could include less visitor enjoyment and damage to park resources. Overcrowding could be a significant problem particularly for those parks that offer a break from heat and are close to major population centers, including Assateague Island.

## **Loss of Fishing**

Fishing is a popular pastime in national parks. But now a changed climate threatens to reduce fish populations and recreational fishing opportunities in the parks. In the nation’s coastal parks, fishing for marine species could be affected. At Assateague Island, surf fishing is popular, but the beaches where people fish—or access to them—could be lost if the island is fragmented or inundated by sea-level rise. In the future, if populations of trout species decline as precipitously as scientists project, anglers might face more restrictions on trout fishing in Shenandoah.

## **More Air Pollution**

A hotter climate is projected to worsen concentrations of ground-level ozone, a component of smog created when pollutants mix in sunlight. Ground-level ozone has been firmly established to harm people’s health, and the U.S. Environmental Protection Agency has set air quality standards at the levels necessary to prevent adverse health effects. Many people think of ozone as a big-city air pollution issue, but it is a problem in many national parks, affecting both the enjoyment and the health of visitors. Based on monitoring with portable equipment, monitoring sites near parks, and other methods, the NPS thinks that Assateague Island in 2005-2007 violated the ozone standard. Ozone-caused damage to vegetation has been documented in Shenandoah. Because future climate-change driven increases in ozone levels

are expected to be greatest where ozone levels already are high, these parks are at risk of continued, perhaps worsened, levels of unhealthy air.

For documentation of the sources used for this fact sheet, please see the full report, *National Parks in Peril: The Threats of Climate Disruption*, at [www.rockymountainclimate.org](http://www.rockymountainclimate.org) or [www.nrdc.org/policy](http://www.nrdc.org/policy).