Climate Change and Florida's National Parks

Florida is among the most climate change-threatened states in the United States. Florida's treasured national parks—spanning the Greater Everglades ecosystem northward into Gulf Islands National Seashore and beyond—are being impacted by our changing climate.

Climate change is the greatest threat America's national parks have ever faced. Nearly everything we know and love about the parks—their plants and animals, rivers and lakes, beaches, historic structures, and more—is already under stress from our changing climate. As America's leading voice for our national parks, National Parks Conservation Association (NPCA) is at the forefront of efforts to address climate impacts and promote science-based policies that enhance the resilience of our incredible system of national parks. With Florida's low elevation, national park sites in the state are especially susceptible to the threats associated with climate change. Sea level rise, changing ocean conditions, and shifting weather patterns are impacting our landscapes. All of these climate impacts converge to present unprecedented challenges to park management, preservation, tourism, and Florida's economy. NPCA's Sun Coast region is systematically assessing, through research and analysis, the most serious climate impacts threatening national park landscapes. This regional climate dispatch thus serves a twofold purpose: to shine a light on climate case studies across iconic Floridian places, and to share what NPCA's Sun Coast team is doing to help address and adapt to climate threats to our treasured national park ecosystems.

Above: Florida Bay in Everglades National Park ©South Florida Water Management District

NATIONAL PARK THREAT

Rising Sea Levels Threaten Biodiversity & Cultural Resources

While all national park units in Florida are threatened by sea level rise, some parks are more vulnerable than others. Dry Tortugas National Park, located 70 miles west of Key West, is perhaps the most endangered national park in the park system and at risk of being completely submerged by rising seas. While many of Dry Tortugas' treasures are underwater, including abundant fish, sea turtles, and colorful coral reefs, the park also protects Fort Jefferson, which was built to protect one of the most strategic deepwater anchorages in North America. The fort allowed the United States to maintain an important post for ships patrolling the Gulf of Mexico and the Straits of Florida.[1] Already threatened by inundation, Fort Jefferson and the seven small islands in Dry Tortugas National Park are just above sea level, with some areas below sea level rise projections. While marine resources will remain if the park becomes submerged, historical treasures and critical bird and sea turtle nesting habitat are at risk of disappearing. For example, the island of Bush Key in Dry Tortugas is home to about 80,000 sooty terns and is the only nesting colony of sooty terns in North America.[2] The island is only about two feet above sea level, and a projection from the National Oceanic and Atmospheric Administration (NOAA) predicts sea level rise of 40 inches in Southeast Florida and the Florida Keys by 2070.[3]

As our country's third largest national park (of the lower 48 states) and designated International Biosphere Reserve, World Heritage Site, and Ramsar Wetland of International Importance, Everglades National Park protects an abundance of biodiversity and subtropical wilderness habitat. Unfortunately, Everglades National Park is also one of the most vulnerable national parks to the impacts of sea level rise, which threaten the park's landscape and biodiversity. The Everglades' relatively flat landscape makes it especially vulnerable to saltwater overrunning its marshes, prairies, forests, bays, estuaries and tidal flats. Everglades National Park protects 183 state-listed rare plant species (including at least fourteen endemics), and numerous regionally rare species that are likely to be affected by sea level rise.[5]

Many of these species have evolved to adapt to specific fresh- or brackish- water environments and hydrological conditions present across our diverse Everglades wetlands and uplands, and thus may be impacted or displaced by species that can tolerate climate-altered conditions.

Top: Nesting habitat for the sooty tern at Dry Tortugas National Park is threatened by sea level rise ©National Park Service **Above:** Fort San Felipe Del Morro in San Juan National Historic Site is an historic structure that is susceptible to climate impacts ©Serge Yatunin | iStock

NATIONAL PARK THREAT

Changing Ocean Conditions Endanger Coral Reefs

Located just outside of Miami, one of the largest metropolitan areas in the nation, Biscayne National Park is the largest marine park in the National Park System. It is a national treasure and provides visitors with a unique underwater marine world that they might never otherwise have access to. The park protects part of the third largest barrier reef tract in the world and some of the only living reef in the continental United States. Biscayne is filled with marine life that are struggling to thrive as ocean conditions fluctuate because of the climate crisis.

While oceans naturally serve as carbon sinks, increasing concentrations of greenhouse gases in the atmosphere caused by human activities have dramatically increased the amount of carbon being absorbed by oceans, causing ocean acidification. The uptake of carbon by the

oceans from the atmosphere lowers the pH of the ocean, making it more acidic. Ocean acidification compromises corals' ability to absorb the calcium carbonate they need to support their stony skeletons and leads to weakened and dissolving reef structures. Our oceans are also warming, with excess atmospheric heat caused by increased carbon in the atmosphere leading to rising ocean temperatures. When ocean and air

temperatures increase, ice caps across the world melt and a perpetuated cycle of melting and warming allow for ocean temperatures to rise further as there are fewer bright surfaces reflecting solar energy. Steadily rising ocean temperatures have caused widespread coral bleaching events in recent years. Bleaching occurs when corals get stressed by high water temperatures, expelling the photosynthetic algae that reside in them and give corals their color. If the stress causing bleaching episodes isn't severe and corals are generally healthy, they can potentially recover. However, bleaching events often lead to widespread coral mortality.

Left: Coral bleaching may become more common as climate change impacts intensify ©Nikold Ordway | Florida Department of Environmental Protection **Above:** Changing ocean conditions may cause further harm to coral reefs in Biscayne National Park ©Durden Images | Istock

Coral reefs in Biscayne National Park have been ravaged in recent years by a number of factors, including massive bleaching events and coral disease. Currently, more than 20 of approximately 45 species of corals in Florida have been affected. Changing ocean conditions brought on by climate change harm the health of corals and make them more susceptible to disease. At the present rate of bleaching events taking place throughout the world, it is projected that by 2030, 60% of all coral reefs are expected to be highly or critically threatened, and 98% of coral reefs will be exposed to potentially fatal conditions every year.[6] Diseased and dying corals are less effective at providing key ecosystem services, such as buffering wave energy, promoting storm resilience, and serving as vital habitats for many marine species, including some listed as critically endangered.

NATIONAL PARK THREAT

Shifting Weather Intensifies Storms & Alters Ecosystems

Climate change is creating conditions that allow for storms to become stronger. Increasing sea surface temperatures and the moisture-holding capacity of the air lead to more powerful tropical storms and hurricanes.[7] Storm surge, sea level rise, and heavy rainfall not only move water further inland but also prolong flooding and increase erosion. Built structures and lands that preserve cultural and historical heritage throughout Florida's national parks are highly threatened by extreme weather events. In Timucuan Ecological and Historic Preserve in Jacksonville, the historic Fort Caroline National Memorial and Ribault Monument are both threatened by

Above: Wetland habitat at Timucuan Ecological and Historic Preserve in Jacksonville, Florida ©National Park Service

subsidence and erosion resulting from sea level rise and increasing storm intensity.

The climate crisis is also expected to bring changes to overall precipitation patterns. Since annual rainfall in Florida is already unevenly distributed, there are periods of time throughout the year where there is a heightened risk of drought and wildfire. Rainfall totals from future climate change and emission scenario models illustrate how prolonged dry and wet

periods vary in future projections. It has been difficult to determine whether future rainfall amounts will increase or decrease in Florida as climate change progresses.[8] However, the state is projected to experience more sporadic precipitation events and an increase in future storm intensity, even if total rainfall amounts end up decreasing. These changes could lead to more intense drought-flood cycles and longer dry periods.[9]

National parks in Florida are sensitive to changes in weather conditions and precipitation patterns. Big Cypress National Preserve, the USA's first national preserve and a western extension of the Everglades hydrologic system, has had

its biodiversity adversely impacted by dry conditions and put at increased risk of wildfires. March 2020 was the driest month on record for Florida in 89 years, with the Big Cypress region having one of the largest rainfall deficits in the state.[10] The Big Cypress depends on the seasonal flow of freshwater. During the wet season, about 90 percent of the preserve is inundated, while only 10 percent is inundated in the dry season. Water availability could further decrease as dry seasons extend and rainfall events become more sporadic. Decreased water availability in Big Cypress will have ancillary impacts in Everglades National Park, as the preserve is responsible for about 42 percent of freshwater flow into Everglades National Park.[11]

Left: Beach erosion is becoming more common in South Florida as climate change impacts are intensified ©Jaimie Tuchman | iStock

Above: Cypress ecosystems are dependent on seasonal water flow that may be impacted by climate change ©National Park Service

CLIMATE CHANGE IMPACT

Climate Impacts to Public Lands & Waters Affect Florida's Economy

Impacts associated with the climate crisis are endangering Florida's national parks and public lands, all the while jeopardizing tourism and recreation industries that are critical to the state's economy. In 2019, roughly 13 million people visited Florida's national parks, spending an estimated $722 million.[12] With Florida's economy highly dependent on tourism, declines in revenue generated by recreation and visitor spending in our national parks because of climate change could have major impacts on gateway communities that depend on a steady flow of tourists drawn to the wonders of our national parks.

Above: Exploring mangrove habitat is an iconic experience that all national parks of the Greater Everglades ecosystem provide. ©PJim Feng | iStock

NPCA
SUN COAST
REGION

Our Work to Address Climate Impacts & Build Resilience

South Florida is already experiencing the impacts of a changing climate. More intense and frequent storms and flooding, saltwater intrusion, and species migration are well documented. The Greater Everglades ecosystem is critical to enhancing the resilience of Florida. Because South Florida is ground zero for climate change, restoring the Everglades is one of the most significant tools that Florida, and indeed the entire U.S., has to both mitigate and adapt to climate change.

From restoring mangrove shorelines and seagrass meadows that will help mitigate climate impacts, to protecting our drinking water supply from saltwater intrusion, expediting Everglades restoration will make our region more resilient. Notably, by restoring freshwater flows from the Everglades into salt marshes, mangrove forests, and seagrass meadows, we are helping to restore habitats that are key carbon sinks. NPCA leads a robust portfolio of Everglades advocacy—from supporting critical restoration projects to requesting much-needed funding to bring these projects to fruition. NPCA has been on-the-ground in South Florida supporting Everglades restoration for decades.

Above Left: Restoration of mangrove and "blue carbon" habitat in Everglades National Park can help South Florida become more resilient to climate change impacts ©National Park Service **Above Right:** Grouper in Everglades National Park ©National Park Service **Below:** An egret in Everglades National Park ©National Park Service

NPCA leads advocacy efforts in support of several Everglades restoration projects that will increase South Florida's climate resiliency, including: the bridging of Tamiami Trail to improve freshwater flow into Everglades National Park; the Everglades Agricultural Area (EAA) Reservoir to store, treat, and flow water from Lake Okeechobee through the Southern Everglades and Florida Bay; and the Combined Operations Plan (COP) which determines the volume and distribution of increased freshwater flow to the Southern Everglades.

Restoring the Greater Everglades ecosystem is critical to enhancing the resilience of South Florida

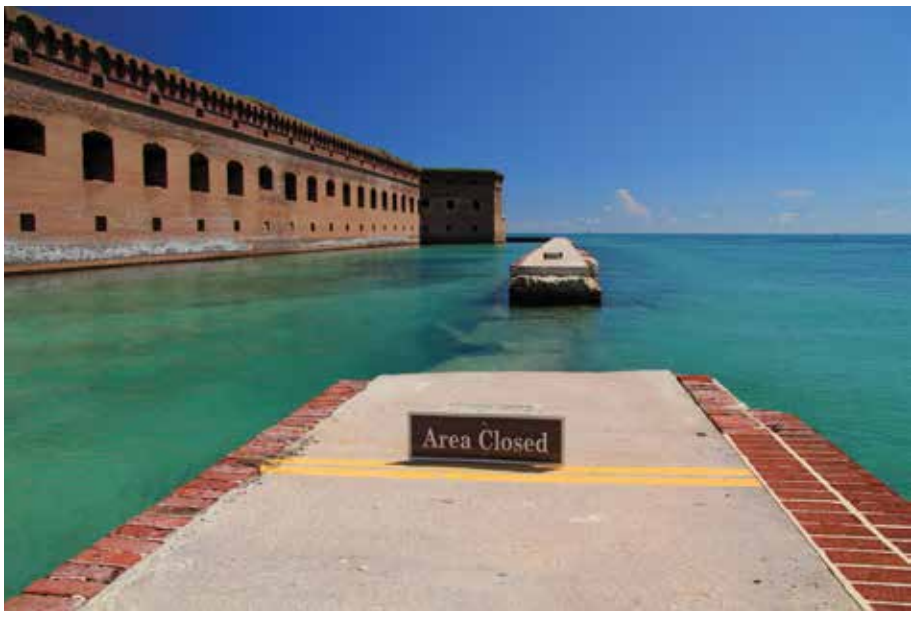
While halting coral bleaching and ocean acidification will take large-scale efforts to be effective, NPCA is a local leader in advancing measures to improve the overall health of Biscayne's coral reef ecosystem. Reducing local stressors, such as overfishing and overuse, will go a long way towards enhancing coral resilience in light of climate change. For years, NPCA has been leading efforts to enhance protections for Biscayne's coral reef ecosystem through the creation of a no-fishing marine reserve. A marine reserve would set aside a portion of Biscayne's reef, allowing fish populations to recover and providing coral structures protection from damage associated with fishing gear and boat collisions. Healthy reefs also help buffer our community against storm surge associated with tropical storms and hurricanes intensified by climate change.

Recognizing the threats posed by climate change to our drinking water supply and coastal areas in the form of sea level rise and saltwater intrusion, NPCA has been leading efforts to restore freshwater flow to Biscayne's coastal areas. Improving the quality, quantity, and distribution of freshwater along Biscayne National Park's coastal wetlands will help restore coastal ecosystems, which protect communities from storm events, and stave off saltwater intrusion by adding more freshwater to our underground aquifer.

Fort Jefferson, located in Dry Tortugas National Park, is the largest all-masonry fort in the United States and was built (construction began in 1846) to protect one of the most strategic deepwater anchorages in North America. Fort Jefferson represents the highest achievements of nineteenth century American military architecture and civil engineering and is threatened by rising seas and storms increasing in frequency and strength.

Storm damage has already occurred with the breaching of the fort's mote wall during Hurricane Irma that has yet to be addressed. While major investments are needed to remedy the mote wall damages, NPCA has for years been supporting the work of an incredible group of veterans that are carrying out much-needed construction and maintenance efforts elsewhere on Garden Key, where Fort Jefferson is situated. With

Above: Boats damaged during Hurricane Irma on the shore of Florida Bay ©Felix Mizioznikov | iStock **Below:** The historic moat at Dry Tortugas National Park remains closed after hurricane damage ©wilsilver77 | iStock

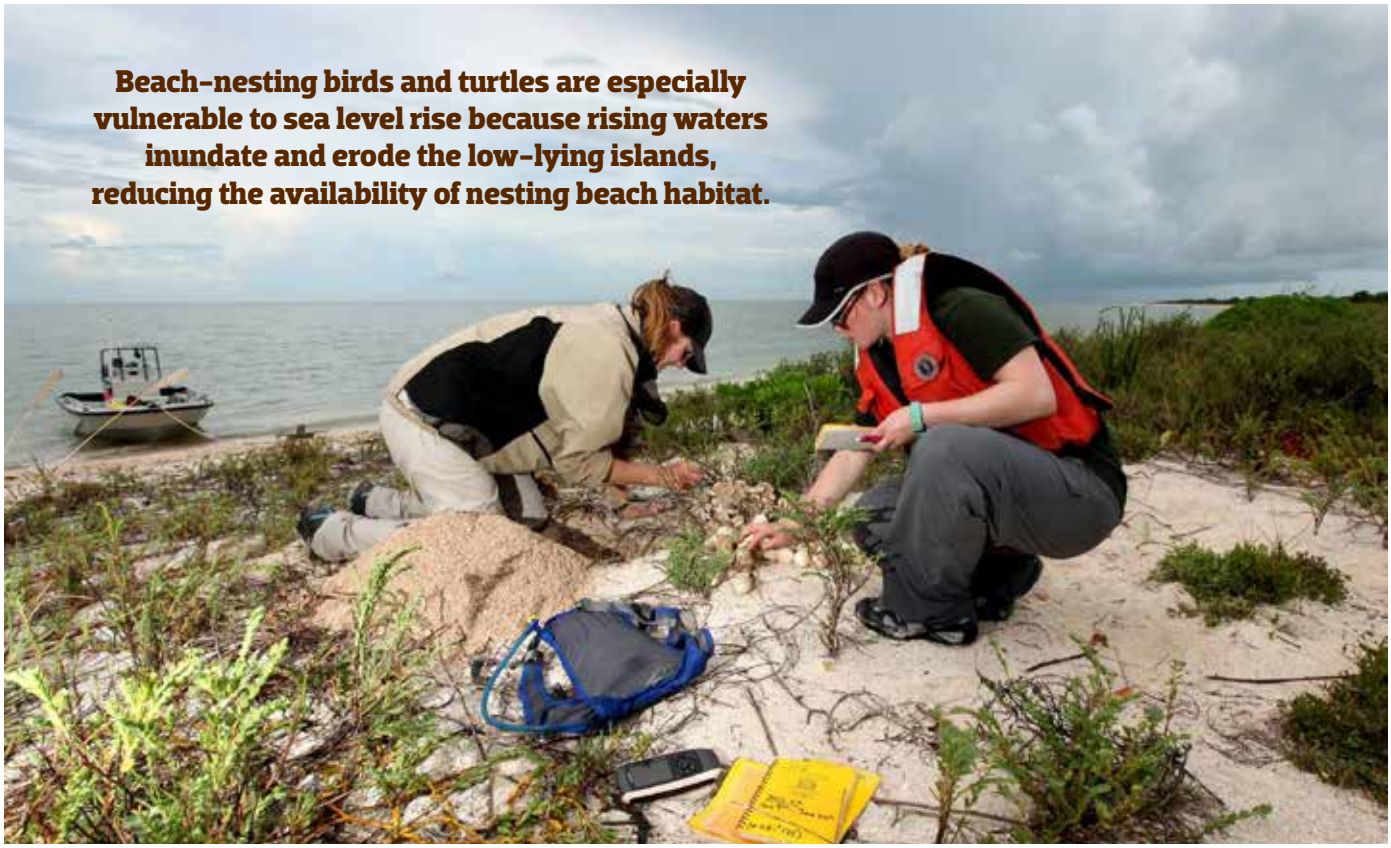


one percent land mass and 99% water, Dry Tortugas National Park contains luxurious coral reefs, seagrass meadows and abundant marine & terrestrial wildlife. Beach-nesting birds and turtles, for example, are especially vulnerable to sea level rise because rising waters inundate and erode the low-lying islands, reducing the availability of nesting beach habitat. NPCA's work to advance climate mitigation will help to protect the world's largest nesting colony of Sooty Terns, who nest not in trees but among low-lying plants and in the sand in Dry Tortugas, and also help to protect habitat for several species of sea turtles that lay their eggs on the shores of the low-lying Tortugas islands.

Big Cypress National Preserve, our nation's first preserve, is the flagship site for NPCA's work defending against fossil fuel exploration and development within national park unit boundaries. This work directly contributes to mitigating climate change by preventing these carbon-storing and sequestering lands from transitioning to sources of additional fossil fuel consumption and release into our atmosphere. Did you know that many of our national park units, such as Big Cypress, still contain privately-held mineral rights below the very ground that is our protected public land? NPCA works locally and nationally to advance the notion that our protected public lands should be part of the climate change solution, instead of contributing to the problem.

When the exploration or extraction of those fossil fuels will cause unsustainable damage to national preserve landscapes, the National Park Service has the authority to prevent or halt those damaging activities. NPCA is a leading voice in advocating for the Park Service to protect Big Cypress against the serious impacts that recent oil exploration has had inside the boundaries of the preserve... an irreplaceable preserve that is home to the critically endangered Florida panther, iconic ghost orchids, Florida bonneted

Above Left: Habitat of the endangered Florida panther is threatened by fossil fuel development in Big Cypress National Preserve ©bephotographers | iStock **Above Right:** The elusive Ghost Orchid ©gpalms | Dreamstime **Below:** Everglades National Park staff survey sea turtle nests ©National Park Service



Beach-nesting birds and turtles are especially vulnerable to sea level rise because rising waters inundate and erode the low-lying islands, reducing the availability of nesting beach habitat.

bats, and numerous plant and animal species found nowhere else in the world. The oil exploration that has occurred inside Big Cypress since 2017 is the single most damaging energy development project happening inside national park boundaries anywhere in the country. NPCA's Sun Coast team has fought against this from the very start and will continue the effort to prevent any future damaging oil exploration or extraction from being carried out inside our treasured Big Cypress National Preserve.

NPCA fights to defend America's iconic national parks, working to address the plethora of climate impacts plaguing the region, including rising seas, changing oceans, diminishing biodiversity, droughts, floods, shifting seasons, changing landscapes, and harm to recreation and visitation and local economies. As national parks unite America's broad, diverse and bi-partisan communities, NPCA will continue our efforts to protect our nation's shared natural treasures and histories.

HOW YOU CAN HELP

To keep parks safe from the greatest threat they have ever faced we must do two things: reduce climate pollution and help parks and communities become more resilient. Each one of us has a role to play. Visit us at **npca.org/climate** to learn more about our work and to join us. You can email us at suncoast@npca.org. Together with 1.4 million members across the nation, we are leading on action to protect our national parks.

Above: Gulf Islands National Seashore in Pensacola, Florida ©lightphoto | iStock

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