

Climate Change and Our National Parks

This activity explores nine national parks from across the country. Students will be asked to think about global climate change and the potential impacts to both the ecosystem and the surrounding communities of that area.

Educator Summary

The National Park Service mission statement charges the organization with conserving the scenery, including the natural and the historic, for the continuing enjoyment “as will leave them unimpaired” for future generations. The system includes habitat protection for 378 threatened or endangered species, 100 million museum items, 27,000 historic and prehistoric structures, and 17,000 miles of trails. This is a difficult task in the best of times. With a changing climate comes an increase in the challenge. The list of changes our planet is likely to undergo with increasing carbon dioxide in our atmosphere is daunting and includes rising sea levels, increasing air and water temperatures, changes in precipitation, increasing evaporation, and shorter, milder winters.

Key Concepts

- Students will learn about the ecosystems and climate of national parks across the country.
- Students will predict how climate change will impact these national parks.
- Students will predict how climate change will impact the plants and animals protected by these national parks.

Grade Level: 6th–8th

Materials: National Park cards and questions, large paper and markers

Time: 1 hour

Introduction

Across the country, there are nearly 400 places preserved and protected by the National Park Service. They range from temperate rain forests to southwestern deserts, from canyons to mountains, from historic homes to mangrove forests. As a nation, we have decided that these places shall remain as they are for future generations. National parks have rules to limit the impact that people can have on these treasures. However, there are some human impacts that the Park Service can't control. A changing climate will impact the national parks. Rising sea levels, changing precipitations patterns, worsening storms, and increasing air temperatures will occur inside national parks just as they occur outside. National parks across the country will be impacted in different ways. The plant and animal communities protected by our parks will have to adapt or they will not be able to survive through some of these changes. Species already on the edge of extinction may be pushed over that line; others will thrive as their habitats expand. In

this activity, students will learn more about one national park and brainstorm how a changing climate may affect the plants, animals, and people of that place.

Procedure

- 1) Pass out the maps of the United States National Parks (These can be found at: http://www.pueblo.gsa.gov/cic_text/travel/parkserv/NPSmap2.pdf.)
- 2) Ask the students to think about the different regions of the United States. List these on the white board with the region as the heading of a column. Fill the columns with characteristics of these regions (For example, Desert Southwest: dry, cactus, sagebrush, hot, monsoon season, rivers can dry up, ancient structures, etc.)
- 3) Make sure students are familiar with the following terms, which will be used throughout this activity: **invasive** species versus **non-native** species versus **native** species, **sensitive** species versus **threatened** species versus **endangered** species, **endemic** species, and **biodiversity**.
- 4) Divide students into small groups of up to five.
- 5) Give each group one of the National Park Cards and one National Parks and Climate Change Questions sheet.
- 6) Using the information on the card and the map, the group will fill in the information on the question sheet.
- 7) Now that the groups have made their predictions, hand out the Climate Change in the Parks cards. The groups may use this information to “check” their predictions. Remember that the information on these cards is also based on predictions.
- 8) Ask the groups to prepare a presentation based on the National Park card and the Questions card.

Wrap -Up

National parks across the country are facing a variety of challenges that will come with a changing climate. As a group, list the common impacts that came up again and again in these presentations. List the impacts that only affected one or two of the parks. Now look at the region where these parks are located. Climate change is not only coming to national parks. The whole region where this park is located will feel some, if not all, of these changes.

Discussion Questions

- Are all of the impacts of climate change “bad” in all places?
- What other sorts of information would have been helpful in making predictions?
- Are all of these parks facing the same level of threat from climate change?

- What are some of the variables that may cause the rate of climate change to speed up or slow down?

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Bandelier National Monument

(New Mexico)

About the Park

Bandelier National Monument is in northern New Mexico, on the slopes of the Jemez Mountains and at the edge of the Southern Colorado Plateau. The elevation ranges from a little over 5,000 feet along the Rio Grande to over 10,000 feet at the tops of its highest mountains. This big change in elevation over a relatively short distance provides many different types of habitat found only in Northern New Mexico. The variety of plants and animals in the area as well as a year-round supply of water in what can be a dry region accounts for Bandelier's long history of human occupation, which extends back for over 10,000 years.

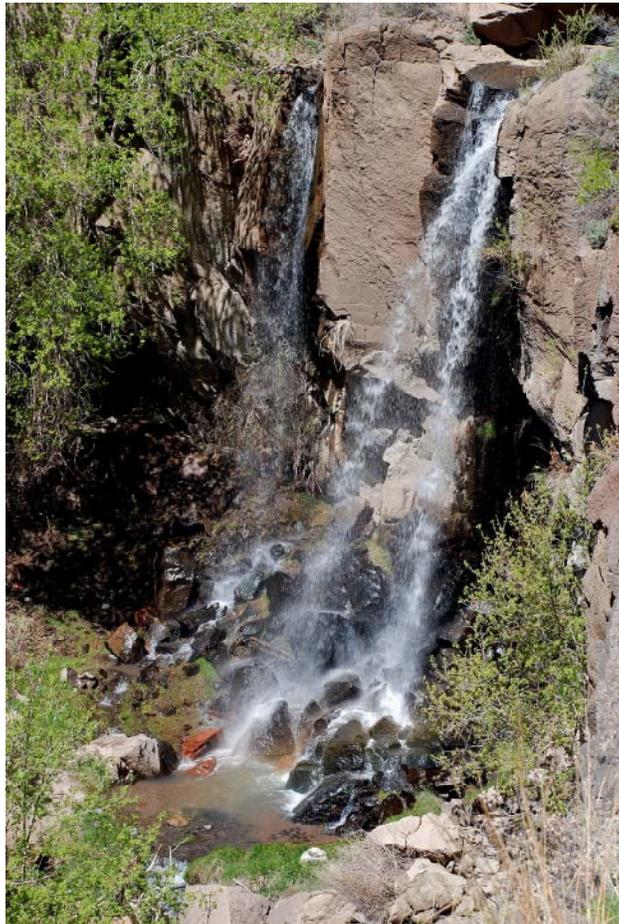


Photo: Sally King

Bandelier National Monument

(New Mexico)

How will climate change affect this park?

Increased temperatures will make the area more susceptible to drought and fires. Organisms at Bandelier are dependent upon the water cycle, not only in terms of the amount of flow, but also in terms of timing and frequency. If there is not a sufficient amount of rainfall during the year to fill the underground aquifers, the springs in the park will not provide moisture during droughts. Plant species in mountainous, arid, and semi-arid areas are slow-growing and not as able to adapt quickly to changes in precipitation or to grow back quickly after fires. This creates an opportunity for invasive plants and animals to move in and stay, altering the ecosystem.

What is the National Park Service doing?

Bandelier is taking part in a research program that is trying to predict the responses of mountain ecosystems to climate change and come up with appropriate management strategies. In addition, park staff members have created and are following a plan to reduce greenhouse gas emissions in the park. The plan includes installing recycling bins throughout the park, and using energy-efficient light bulbs and fixtures.



Photo: Sally King

Everglades National Park

(Florida)

About the Park

Everglades National Park is North America's only subtropical preserve, with 137 miles of coastline. With 1.5 million acres protected, it is the third largest national park in the continental U.S. (behind Death Valley and Yellowstone). It is an extremely low-lying area: two-thirds of the Park lies less than three feet above sea level, and it has a natural maximum elevation of eight feet. Nine distinct habitat types have been identified in this warm, wet area including uncommon habitats such as mangroves, pinelands, cypress forests, and freshwater sloughs. These diverse habitats are home to more than 1,000 species of plants, 20% of which are non-native. The Everglades' climate makes it well suited for many invasive plants and animals, such as the Burmese Python, one of the largest snake species in the world. The Everglades are also home to a wide variety of native wildlife, including many endemic and endangered species, such as the Manatee and the Florida Panther. More than 360 species of birds have been recorded in the park, and the list continues to grow.

The Everglades is a highly disturbed system. Much of this area was drained by people in the early 1900's to make this swampy land more suitable for farming and development. Everglades National Park was established in 1947 to conserve the natural landscape and prevent further degradation of its land, plants, and animals. To this day, the hydrology of the area remains largely disturbed, although efforts are continually being made to restore this area to as natural a state as possible. The large and fast growing human population in southern Florida also puts pressure on this area, especially in regards to water resources.



Great Egret in cypress swamp. Photo: Rodney Cammauf, National Park Service

Everglades National Park **(Florida)**

How will climate change affect this park?

Sea-level rise (predicted by IPCC 2007 report) could have significant impacts on this low-lying park. Park researchers report that sea level on Florida's southern coast has risen nine inches in the past century, six times faster than the per-century rate over the previous 2,400 years. Sea-level rise could lead to inundation and dramatic shifting of fragile and rare ecosystems, such as the pineland forest. Species that depend on these ecosystems could face habitat loss. For example, the endangered Cape Sable Seaside Sparrow, which depends on shallow marshes, would be further threatened if these shallow marshes became deeper. Erosion and salt water intrusion are also concerns associated with sea level rise. In addition to the extent of sea level rise, the rate of rise is of concern because mangroves, which protect much of the Everglades coastline from erosion and provide habitat for many species, may not be able to move upland as fast as the sea rises. Lastly, climate change may cause a rise in water temperatures in this area. Some scientists think this could lead to more, and stronger, hurricanes. Warmer waters also threaten many marine animals including corals and some fish.

What is the National Park Service doing?

It may be hard for the Everglades ecosystems to be resilient in the face of multiple stressors. Therefore, Park managers are doing things to manage the risks that can be controlled, such as human damage from boats and hydrology restoration efforts, so that the ecosystems are at their best when they face the challenges of climate change. The Park is making steps to curb its emissions by reducing the number and size of staff vehicles, both marine and automotive. The Everglades has also committed to increasing climate change education in the Park “with a goal of providing 100% of visitors to the Park with the opportunity to be exposed to climate change issues.”



Photo: National Park Service

Gates of the Arctic National Park **(Alaska)**

About the Park

There are no trails, roads, campgrounds or facilities in this expansive wilderness in Northern Alaska. At 13,238 square miles, it is the second largest national park in the U.S. and lies mostly in the Brooks Mountain Range, an alpine arctic mountain range. Located entirely above the Arctic Circle, come June, this is truly the land of the midnight sun. The habitat is mostly tundra, which is dotted with many wildflowers in the warmer months. Most of this national park is in the permafrost zone, meaning that the land underfoot is permanently frozen to varying depths. Here you can see a variety of wildlife, many of which are rarely seen elsewhere, such as grizzly bears, moose, caribou, wolves, musk oxen, and arctic ground squirrels. Thousands of caribou migrate annually through this region in search of dense lichens to eat. Additionally, 145 species of birds have been recorded in the park, many of which are long distance migrants that travel vast distances each summer to reach this extremely productive environment fueled by constant sunlight. The harsh climate in this region keeps out many land predators, invasive species, and pests. Gates of the Arctic is unique for a U.S. national park in that some 1,500 people reside in 10 small communities in the Park's "resident subsistence zone" where they rely on the Park's natural resources for survival.



Photo: Don Pendergrast, National Park Service

Gates of the Arctic National Park **(Alaska)**

How will climate change affect this park?

Over the past 50 years, average temperatures in Alaska have risen twice as fast as temperatures in the rest of the United States, according to the seminal report released in June 2009 by the United States Global Change Research Program. Average summer temperatures have risen 3.4° Fahrenheit, while winter temperatures have risen 6.3° Fahrenheit. This is impacting the state and its national parks in many ways. Gates of the Arctic National Park lies entirely in the permafrost zone, meaning that the ground beneath the tundra and mountains is permanently frozen. Parts of central Alaska previously within the permafrost zone have begun to melt, changing the earth's surface above it dramatically, altering ecosystems and hydrology, and causing trees to tilt, buildings to crack, and roadways to buckle. This thawing could move into the Brooks Range and Gates of the Arctic if warming trends continue. Longer summers and higher temperatures are causing drier conditions and fewer lakes, altering important breeding habitats for birds and other animals. This also may lead to an increase in wildfires. Additionally, changes in seasonal timing may have many effects on wildlife, such as the caribou that make long migrations every year and may now find some rivers impassable due to increased spring run-off.

What is the National Park Service doing?

The Park Service is in the process of creating an amendment to the 1986 General Management Plan. The Park Service attributes the need for this amendment to conditions that have changed since the plan's original creation. The park highlighted climate change as one of three major emergent issues since 1986. Additionally, the Dalton Highway, which runs along the Park's eastern border only five miles outside the park boundary, has opened to the public, making this area accessible by road for the first time.



Photos: National Park Service Collection

Great Smoky Mountains National Park **(Tennessee/ North Carolina)**

About the Park

The Smokies, also known as the “Salamander Capital of the World,” are known for their biodiversity. With an estimated 90,000 species of plants and animals living in 800 square miles, no other area of equal size in a temperate climate has a comparable numbers of species. The Smokies, a part of the Appalachian Mountain chain, are some of the oldest mountains in the entire world. Their elevations range from 875 feet to 6,645 feet above sea level, providing unique and diverse ecosystems. The forest diversity seen walking from the bottom of a mountain to the top is often compared to the forest habitats seen traveling from Georgia to Maine.

Waterfalls, some of the oldest forests on the East Coast, around 900 miles of trails, and amazing views make the Great Smoky Mountains National Park the most visited national park in the world, with around 9 million visitors a year. The Park is one of the largest wilderness tracts in the eastern U.S., providing habitat for black bears, river otters, elk, 200 species of birds, and numerous endangered species.



The Smokies are known for their mist and blue haze. Photo: Ken Voorhis

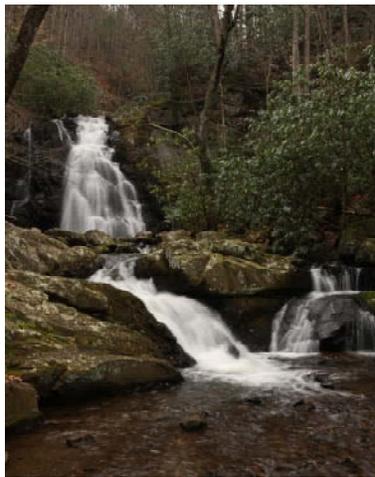
Great Smoky Mountains National Park **(Tennessee/ North Carolina)**

How will climate change affect this park?

Unfortunately, the Smokies have some of the worst air quality of any national park. In recent years, mountain views have decreased 80% due to the haze from air pollution. Sometimes, the air quality is so bad that there are “ozone alert days,” where strenuous activity, such as hiking, is not recommended. As average temperatures in the southeastern U.S. increase, forest species have to adjust and adapt. Species unique to the Park’s high elevation forest, such as the Fraser fir, red spruce, and northern flying squirrel, will struggle to find suitable habitat. The Smokies can expect to lose 17% of their mammalian species due to shifts in distribution ranges. As temperatures increase, the cool mountain streams will warm, affecting the Park’s cold-water fish, such as brook trout. The Smokies receive an average of 55 inches (at lower elevations) to 85 inches (at higher elevations) of rainfall a year. Scientists believe that climate change in the southeastern US will lead to an increase in yearly rainfall. Due to the Smokies’ steep slopes and plentiful rain, landslides are fairly common and might increase with this increased rainfall. Increased levels of carbon dioxide may, however, increase forest growth in the Smokies.

What is the National Park Service doing?

Park rangers, researchers, and volunteers are participating in an immense project called the All Taxa Biodiversity Inventory. The goal is to inventory every living species in the Park to better understand and describe the biodiversity of the Smokies. Without this inventory, we will not know what changes, if any, occur in species population distribution due to increased temperatures. In addition, a 70-mile section of the Appalachian Trail runs through the Park. The NPS helps maintain this trail, providing a 2,175 mile corridor of protection for species. The Smokies Interpretive Rangers have also included climate change into their programs, hoping to educate park visitors on the affects they have on the environment.



Spruce Flats Falls. Photo: Les McGlasson

Hawai'i Volcanoes National Park **(Hawai'i)**

About the Park

Hawai'i Volcanoes National Park sits on the southeastern edge of the youngest and largest island in Hawai'i and is home to many diverse plants and animals. It is famous for its volcanoes, but also has many different ecosystems, including coastlines, rainforests, woodlands, and lowlands. The Park is one of the few remaining natural areas in Hawai'i that protects contiguous habitat from sea to summit. The islands are distant from large land masses, so the native plants and animals have not been influenced by neighboring species. More than 90% of the native terrestrial flora and fauna in Hawai'i are found only in the Hawaiian Islands.



Holei Sea Arch Photo: National Park Service

Hawai'i Volcanoes National Park **(Hawai'i)**

How will climate change affect this park?

Changes in temperature and rainfall will affect many of the unique plant and animal species that have adapted to specific niches within their ecosystems. For organisms that live in high alpine zones, there is no higher and cooler place for them to move as the temperature rises. Changes in precipitation will affect native birds' ability to breed and handle disease. As the sea level rises, areas of cultural importance and breeding grounds for endangered species will become covered with water. As the ocean increases in acidity, coral organisms will not be able to create the skeletons they use to build coral reefs.

What is the National Park Service doing?

Scientists at Hawai'i Volcanoes National Park are studying coral reefs, native birds, and endangered species, such as the Hawaiian Monk Seal, to determine what affects changes in temperatures will have upon them. They are also working with native Hawaiian elders to determine what changes have already occurred in the island habitats and to make a list of culturally important places and plants that will be affected. The Park has taken measures to reduce its carbon footprint by adding solar panels to Park buildings and testing a hydrogen hybrid shuttle system. It is an active member of the Climate Friendly Parks program, with staff members taking measures to reduce their personal energy consumption. In addition, the Park is working to educate its staff and visitors about climate change and what they can do to help.



Photo: National Park Service

Indiana Dunes National Lakeshore **(Indiana)**

About the Lakeshore

Indiana Dunes is located on the shores of Lake Michigan and encompasses 15,000 acres stretching along 15 miles of shoreline between the cities of Gary and Michigan City in Indiana. The Lakeshore not only protects the beaches along Lake Michigan but expands inland to include dunes, oak savannas, swamps, bogs, marshes, prairies, rivers, and forests. Moving inland from the current shoreline, the Lakeshore encompasses three ancient shorelines that developed as the Great Lakes were formed by melting glaciers. The oldest two dune complexes have developed into stable oak forests. The third, younger dune complex and the current shoreline are still changing with many stages of plant succession visible including open beaches, grass covered ridges, woody shrub vegetation, pine-forests, and oak-forests. This wide range of ecosystems provides for one of the most biologically diverse areas in the national park system, with 1,100 flowering plants and ferns.

The wide range of plant communities provides for a diverse wildlife population as well. Migratory birds in particular make use of the protective cover of the dunes as a resting and feeding spot. More than 350 species of birds have been observed at Indiana Dunes. In the fall, birds migrate south along the edges of Lake Michigan, converging at the southerly tip of the lake, where Indiana Dunes is located.



Waves at Lake View. Photo: National Park Service

Indiana Dunes National Lakeshore **(Indiana)**

How will climate change affect this Lakeshore?

Water levels in the Great Lakes are likely to fall because of the decreased snow and increased evaporation that are products of higher air temperatures. The wetlands that fill the valleys of Indiana Dunes will begin to dry up, decreasing the biodiversity of the area and the value of the area to migrating birds. Precipitation is more likely to come in flooding downpours from heavy storms. Increased temperatures will warm the waters of Lake Michigan, reducing coldwater fish, including salmon and trout. Ground-level ozone, dangerous to people, plants, and wildlife, will increase with warmer air temperatures.

What is the National Park Service doing?

Indiana Dunes has planned several projects to reduce the carbon footprint of the facilities. Solar-powered lighting will be installed throughout the park as will two new “green” roofs on administrative buildings. Green roofs are planted with vegetation and will absorb rainwater, provide insulation, and create a potential habitat for wildlife. The NPS is partnering with other federal agencies and local entities to manage invasive species and will begin a study of shoreline erosion. The Park Service has also developed an extensive monitoring project to detect changes in the breeding bird populations that make use of Indiana Dunes. The extensive wetlands of the lakeshore have been severely impacted by development in the eastern half of the park, but the park service is in the process of restoring portions of an extensive wetland complex called the Great Marsh, south of the primary dunes in the eastern half of the park. Because wetlands naturally filter contaminated water, restoring the Great Marsh will also help to improve the area's water quality. In addition, by plugging ditches, restoring the area's hydrology, removing invasive plants, and planting native species, the National Lakeshore is re-creating a diverse and beautiful ecosystem.



Lake View beach with paper mills in background. Photo: Christopher Light, National Park Service

North Cascades National Park **(Washington)**

About the Park

The North Cascades National Park Complex includes both a National Park and two National Recreation Areas. It lies in the northwestern corner of the U.S. with Canada as its northern border. It covers both the eastern and western flanks of the North Cascades Mountains, lying across the Cascades Crest, which runs north to south through the Park. The Park is famous for having more than 300 glaciers and diverse mountain ecosystems, which include large areas of subalpine and alpine habitat. It is one of the snowiest places on earth and is more glaciated than anywhere in the continental United States. A large portion of the Park is a designated Wilderness area. There are three hydropower dams in the Recreation Areas.



Photo: Megan McGinty

North Cascades National Park

(Washington)

How will climate change affect this park?

The 300 glaciers in North Cascades National Park are disappearing; park scientists report that many of the glaciers have receded noticeably during the last 150 years, resulting in a loss of 40% of the park's ice cover, a pattern that closely matches the warming trend of climate change. Melting glaciers will change soil and vegetation patterns and release old pollutants, long stored in the ice and snow, into fresh glacial lakes and streams. High elevation ecosystems are sensitive and rely on a snowpack deep enough to insulate plants and animals in the winter; with the temperature increases associated with climate change, this snow pack is threatened. Snowmelt is an important source of water for alpine ecosystems in the summer. The snow that falls in the higher elevations in the winter supplies the glaciers with a reservoir of ice that feeds the rivers in the summer, keeping the rivers cool and deep enough for salmon. As the glaciers melt, this important runoff will decrease. Longer summers and shorter winters, which are predicated to come along with climate change, will also contribute to more frequent forest fires in the Park. Because of habitat loss, which may be linked to climate change, species native to the Cascades, such as the gray wolf, grizzly bear, fisher, wolverine, and Townsend's big-eared bat have become threatened.

What is the National Park Service doing?

The Park Service has been monitoring glaciers in the North Cascades since 1993 to understand if the glaciers are melting and if so, how quickly. In addition, they are making an inventory of all the plant and animal species in the park and mapping where they are found in order to keep track of changes. Because North Cascades National Park is one of the best places in the U.S. to see glaciers, park staff members are working on educating themselves and park visitors about the connection between glaciers and climate change. They are also looking at ways to reduce their use of motorized vehicles, and, to use more efficient vehicles when they do need to drive.



Photo: Christian Martin

Yosemite National Park **(California)**

About the Park

Yosemite is nearly 1,200 square miles in size and is located in the Sierra Nevada Mountain Range in California. It is perhaps best known for its unique geologic features including granite domes such as Half Dome, towering cliffs such as El Capitan, dramatic canyons such as Tenaya Canyon, and abundant waterfalls such as Yosemite Falls. Yosemite has a Mediterranean climate, which means it has hot, dry summers and cool, wet winters, with most of the precipitation in the Park falling as snow and melting gradually over the spring and summer months. Yosemite has a large elevation gradient, from about 2,000 feet in the foothills, up to Mount Lyell, the highest peak in Yosemite, at 13,114 feet. As one travels higher up in elevation, the climate gets colder, meaning that Yosemite has a large range of climates, from areas that rarely get any snow to areas that get many hundreds of inches annually. Because of this, Yosemite has a wide range of habitat types, or life zones, and a resulting variety of flora, including oak woodlands, coniferous forests, and alpine habitats, and fauna, including black bears, mule deer, coyotes, and bobcats. At higher elevations, you can see rare animals such as yellow-bellied marmots, golden-mantled ground squirrels, pikas, and gray-crowned rosy finches. Yosemite is also home to four species of endemic amphibians, some of which are threatened. These populations face pressures such as invasive species, high visitation and disturbance, disease, and wildfires. Wildfires are a natural part of the ecosystems in Yosemite. Yosemite is also one of the most visited national parks, with close to 4 million visitors per year. As a result, park management must deal with issues regarding air and noise pollution.



Photo: National Park Service

Yosemite National Park

(California)

How will climate change affect this park?

Because much of Yosemite is high in elevation, most of the winter precipitation falls as snow. Rising temperatures could change much of this snow to rain, as the climate here often hovers around the freezing point. This could be problematic for the rest of the dry, heavily populated state of California, which relies on the slow melt of the Sierra Nevada snowpack to provide year-round water. In fact, 50% of the water used in California originally falls in the Sierra Nevada Mountains. Because of its wide elevation gradient, Yosemite also supports many different life zones and associated species. A changing climate could shift these zones, and there is potential for high alpine species, like the gray-crowned rosy finch and the pika, to get pushed out. Some species, like the giant sequoias, would have a hard time adapting or moving under changing environmental conditions because of their long life cycle. Additionally, warmer, dryer summers could mean a higher potential for large wild fires. Because so many species here already experience other pressures or disturbances, there is concern that even small shifts in climate could be hard for them to deal with.

What is the National Park Service doing?

To deal with high levels of visitation, the Park Service has established a system of free hybrid shuttle buses around Yosemite Valley. Yosemite also has installed solar panels on some buildings and has a program called YES (Yosemite Environmental System) that identifies environmental issues in the park, including greenhouse gas emissions. Because of the number of visitors, there is great potential for education and outreach in Yosemite. Therefore, the interpretation division has taken on climate change education as a main focus for 2010.



Photo: National Park Service

Mississippi National River and Recreation Area **(Minnesota)**

About the Park

The Mississippi National River and Recreation Area (MNRRA) encompasses a 72-mile stretch of the Mississippi River in the Twin Cities metropolitan area of Minnesota. The park was established in 1988 to protect, preserve, and enhance the nationally-significant natural, cultural, economic and recreational values of the Mississippi River that are represented here. Despite its location in an urban area, the park boasts a wealth of natural resources, including the Mississippi River's only true waterfall, a robust bald eagle population, and a world-class fishery. It is also an important resource for the communities along it, and for the entire nation: the Mississippi River provides drinking water and hydropower, carries away treated waste, receives untreated runoff, and continues to serve as a commercial and recreational transportation corridor. The MNRRA includes 54,000 acres, of which the National Park Service owns only 64—meaning that partnerships with state, local, and private organizations are a key to the park's operations, and to the protection of the Mississippi River.



*Top: Mississippi River, Minneapolis, MN;
Bottom: Riverboat, St. Paul, MN. Photos: National Park Service*

Mississippi National River and Recreation Area (Minnesota)

How will climate change affect this Area?

Over the past several decades there has been a documented increase in average temperatures in Minnesota, most prominently during winter months. An increase in spring and summer storm events has been observed. Precipitation in the area has increased by approximately 20%, with resulting increases in river flows. While changes in precipitation are challenging to predict, the Union of Concerned Scientists (UCS) estimates that in future decades, winter precipitation will rise by 15-35% and summer precipitation will decrease by 15%. By the end of the century, this will combine with a 4-8 degree F temperature rise in the winter, and a 7-16 degree F temperature rise in the summer, making summers in Minnesota feel like present-day Kansas. (UCS)

Temperature and precipitation changes have many implications for fish, wildlife, plants and people along the Upper Mississippi River. Insects such as mosquitoes and ticks, and destructive pests such as the gypsy moths that attack forests, will be better able to survive winters, and will likely appear in larger numbers. Non-native species that thrive under a wide range of conditions will out-compete the native species. Many animal species will expand their range northward as the area becomes warmer. Some resident bird species may benefit from a warmer climate, but other species – such as migratory songbirds that use the Mississippi flyway - will likely decline due to increased competition for food and resources. Warming temperatures will result in earlier arrival of migrant birds, earlier budding and flowering of plants, and earlier appearance of butterflies and other insects. As river temperatures warm, algae will be more abundant, and fish species that require cool water will decrease.



Pelicans. Photo: National Park Service

Both floods and droughts are anticipated to increase, with heavier downpours and higher rates of evaporation – affecting river ecology, navigation and recreation. An increase in large rainstorms may increase runoff pollution and expand the “dead zone” in the Gulf of Mexico. Periods of both high and low water levels could create problems for river traffic such as barges and towboats.

What can we do?

The National Park Service (NPS) is working with partners to protect and restore habitats and natural hydrology in the Mississippi River corridor in order to improve ecosystem resiliency. The NPS monitors existing insect pests and invasive plants, and has increased efforts to control or eradicate such pests in order to maintain native plant communities that sustain wildlife. The NPS works with partners to educate people about climate change and how to reduce or mitigate its effects on the Mississippi River.

As individuals and communities we can conserve energy and reduce our “carbon footprint.” Reducing home energy use, supporting renewable energy, using bikes and transit, driving less, planting trees and native plants, making a habit of “reduce/reuse/recycle,” and eating a climate friendly diet (e.g., local, plant based, and less processed) are all ways to slow the rate of climate change. Improving and restoring wetlands, planting rain gardens and holding water on land so it can soak into the ground will help reduce flooding and improve local water quality.

National Parks and Climate Change Park Questions

National Park: _____

Group Members: _____

1. How might the precipitation patterns change in this park with climate change? Will the time of year of rain patterns change? Will the amount increase? Decrease?

2. If the amount of rain is going to change, how will this affect the various habitats in your park?

3. What will happen in your park if storms increase? What sorts of storms might your park be facing?

4. How will your park be impacted if winters get milder and shorter?

5. What will happen to your park with longer and hotter summers?

6. How will a rising sea affect your park?

7. How will the number and timing of visitors to the park change? What does this mean to the park?

8. How can the park address these impacts of changing climate? What can you do?