



Earth Gauge

A National Environmental Education Foundation Program

Climate Change and North American Wildlife

Read about several ways climate change has affected North American wildlife.

PACIFIC MARINE MAMMALS

Pacific marine mammals have adapted to recent changes in ocean circulation patterns and water temperature.

- The area of the Bering Sea where marine mammals such as seals, sea lions and walrus dominate the ecosystem has shrunk over the last 30 years. In Arctic waters, which are covered throughout much of the year by sea ice, bottom-dwelling sea urchins, clams, and crabs exist in abundance and provide food for marine mammals and diving birds. In waters to the south where sea ice cover is more limited (subarctic waters), fish and large invertebrates dominate the food chain. Average water temperatures in the Arctic Ocean have risen by about two degrees Fahrenheit over the last two decades, and the extent, duration, and thickness of sea ice have decreased over the last 30 years. At the same time, subarctic fish and invertebrate dominated ecosystems have expanded into Arctic ecosystems.
- Pacific gray whales spend summers in a range extending from the Pacific Northwest to Alaska, and winters along the Baja Peninsula. Years with less ice cover correspond to longer feeding times and increases in calf survival rates. Some whales are now wintering as far north as the Beaufort Sea, which is north of the Arctic Circle. Warmer temperatures have also resulted in gray whales starting their autumn migration southward an average of 6.8 days later in the year than they did in the 1980's.



Sea Lion Pup. Photo Courtesy of NOAA

CHANGES IN SPRINGTIME EVENTS

Warmer average temperatures in the mid-latitude climates, or climates occurring between approximately 35 and 55 degrees North and South, have generally corresponded to spring events happening earlier in the calendar year.

- The average springtime return date of short distance migratory birds to New York and Massachusetts occurred 13 days earlier in the second half of the 20th century than the first. This was likely due to the two degree Fahrenheit rise in temperature that the Northeast experienced during that period.
- Mean annual springtime temperatures in northern Alaska rose by 4.3 degrees Fahrenheit between 1949 and 2007. Since the 1960's, the average annual date when snow melts and bare ground appears has advanced eight days earlier in the year. These changes have caused tussock cottongrass, an important food source for both reindeer and caribou (two closely-related hoofed species), to bloom and average of 11 days earlier in the year. This has allowed both species to double their spring caloric intake.
- Mean springtime temperatures in central and northern California increased by 3.5 degrees Fahrenheit between 1969 and 2003. During this period, the average date when birds returned from their wintering grounds advanced for most of the region's songbird species. For example, Barn Swallows arrived in central California around 16 days earlier than they did in the 1970's, Black-headed Grosbeaks about 15 days earlier, Warbling Vireos eight days earlier, and Western Kingbirds about 13 days earlier. On the West Coast, positive North Atlantic Oscillation years correspond to warmer winters, more northerly wintering grounds, warmer early spring weather, and stronger winds that assist migration - all factors that encourage earlier spring migration. El Niño years result in prevalent southerly winds from March to May, which speeds spring migrations.
- There are 15 species of bird, including the Rose-breasted Grosbeak and Black-throated Blue Warbler, that are now arriving in Michigan's Upper Peninsula between one and eight weeks earlier than they did in 1965.



The Black Throated Blue Warbler. Photo Courtesy of U.S. FWS

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POPULATION EFFECTS

Climate change has been linked to declines in wildlife populations.

- A warming of the California Current System by one degree Fahrenheit over the last 30 years has been linked to a 90 percent decline in the West Coast Sooty Shearwater population, migratory birds that traverse vast stretches of the Pacific Ocean each year, logging an average of 40,000 miles in the process.
- Ringed seals in the Hudson Bay region dig lairs in the ice and snow, where they rear their pups. Earlier ice break-up and reduced snowfall since 1990 mean that seal pups are now exposed to the elements and predators when they are infants. As a result, pup mortality rates have spiked in recent years.

CLIMATE'S IMPACT ON EVOLUTION

Some individuals within a species are better suited than others to survive different climatic conditions, which is illustrated by recent changes in genetic characteristics.

- Bergman's Rule states that because larger animals have less exposed surface area per unit of body mass, they retain heat more efficiently and are better at surviving in cold climates. Conversely, smaller animals have more exposed surface area per unit of mass, and are better at staying cool. A population of White-Throated Woodrats in New Mexico was studied over an eight-year period when mean summertime temperatures rose by four to five degrees Fahrenheit. As the temperature rose, a 16 percent decline in the body sizes of successive generations of was observed.
- In House Sparrows, wing size is primarily a function of body weight (smaller wings correspond to lighter birds). Higher temperatures favor smaller birds, and smaller birds have smaller wingspans. U.S. temperatures are about 1.4 degrees Fahrenheit warmer than they were a century ago, and wing spans in House Sparrows have shrunk by an average of one-third of a millimeter, or about 0.4 percent.

CASE STUDY: MOOSE

Isle Royale National Park is located in Lake Superior, about 17 miles from the Canadian shore. The population interactions between the island's wolves and their prey, moose, have been studied for decades. Moose populations in Isle Royale are now at their lowest recorded levels, down from nearly 2500 in 1995 to less than 400 today. This decline is likely due to the four degree Fahrenheit warming that the island has experienced over the last 30 years. Moose are sensitive to heat, and even temperatures as low as 67 degrees Fahrenheit can drive the animals to immerse themselves in water to keep cool. Warmer summers mean that there is less time for moose to forage for food and build the fat reserves that sustain them during the winter.

Warmer winters and springs have also stimulated tick populations. Ticks are inactive when the temperature drops below 39 degrees Fahrenheit, and both their activity and population density directly correlate to temperature. Too many ticks cause moose to groom themselves excessively, which results in hair loss and less protection from the winter cold, increasing their susceptibility to freezing.

Isle Royale's wolf populations, which depend on moose for food, have declined along with the moose. Wolf populations now number only about 21 individuals, down from a high of around 50 individuals in 1980. The loss of moose has even prompted "warfare" between two rival wolf packs in the park.

Similar moose population dynamics have been observed in Minnesota over the last 30 years. Surveys in the 1980's typically found thousands of moose. Last year, only 84 moose were counted.



Right: A moose and calves.
Photograph Courtesy of USFWS

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