



Animals play essential roles in the environment and provide many important benefits to ecosystem health. One Health is this recognition that animal health, human health, and environmental health are all linked. Similar to people, wild and domestic animals can be victims of disease. The information presented here is intended to promote awareness and provide background for certain diseases that wildlife may get.



See the [Guidance for Park Visitors](#) section below for tips to safely enjoy your national park trip.

## **Disease Background:**

- ❖ West Nile virus (WNV) is a vector-borne arbovirus (carried by mosquitoes) that can cause disease in birds, mammals, and reptiles.
- ❖ The disease is found nearly worldwide and was introduced to the Americas in 1999 in New York. Since then it has spread throughout the continental United States and infected approximately 300 species of North American birds.
- ❖ WNV cycles primarily between wild avian species (the primary reservoir host) and mosquitoes (the primary vector).
- ❖ Most cases occur from summer to late fall during peak mosquito activity.
- ❖ Many cases of infection appear to be asymptomatic, but serious neurologic forms of disease can develop in humans and animals.

## **Transmission:**

- ❖ There are over sixty species of mosquitoes known to transmit disease but *Culex* species are the predominant mosquito vector.
- ❖ Most transmission is due to mosquitoes but some birds, chipmunks, and squirrels have been shown to shed WNV in oral secretions or feces. There have been outbreaks in alligators, which are able to transmit disease between individuals, possibly by fecal shedding.
- ❖ Raptors (birds of prey) have become infected with WNV by eating infected prey. Hippoboscids (blood-sucking parasites commonly found on raptors) may also transmit the virus between raptors.
- ❖ The role of mammals and reptiles as potential reservoirs in the circulation of WNV is still poorly understood, but in general mammals are considered to be dead-end hosts, which means they do not transmit the virus to mosquitoes or other animals.

## **Wildlife Health Implications:**

### **Avian Species Affected:**

- ❖ Many wild birds are infected without showing clinical signs. It is rare to see clinical signs in infected wild birds as most are found dead.
- ❖ Die-offs of American crows (*Corvus brachyrhynchos*) are commonly associated with WNV as they are one of the most susceptible species.

- ❖ The highest rates of disease and mortality (death) occur in corvids (crows, ravens, magpies, and jays), American robins (*Turdus migratorius*), eastern bluebirds (*Sialia sialis*), chickadees (*Poecile* sp.), tufted titmice (*Baeolophus bicolor*) and house wrens (*Troglodytes aedon*).
- ❖ Many other avian species are susceptible to WNV including owls, hawks, falcons, kestrels, eagles, vultures, sage grouse, wild turkey, pigeons, pelicans, sandhill cranes, cormorants, ring-billed gulls, and finches.
- ❖ In experimentally infected birds or captive birds, common clinical signs include anorexia, rapid weight loss, lethargy, ruffled feathers, and neurologic signs (incoordination, tremors, circling, paralysis, and seizures).
- ❖ Mortality rates in areas with established WNV range between 10-50% but can be higher when the virus is first introduced into a new area.

### **Mammalian Species Affected:**

- ❖ Horses are the most commonly affected mammalian host and most do not show clinical signs. When present, clinical cases often include fever and neurologic signs including paralysis, weakness and seizures and death.
- ❖ Infections have been reported in fox squirrels (*Sciurus niger*), gray squirrels (*Sciurus carolinensis*), eastern chipmunks (*Tamias striatus*), eastern cottontail rabbits (*Sylvilagus floridanus*), mule deer (*Odocoileus hemionus*), white-tailed deer (*Odocoileus virginianus*), and a number of bat species.
- ❖ Reindeer (*Rangifer tarandus*) are particularly susceptible to severe disease and rapid death.
- ❖ Coyotes (*Canis latrans*), red fox (*Vulpes vulpes*), raccoons (*Procyon lotor*), black bear (*Ursus americanus*), and brown bear (*Ursus arctos*) have all been documented to have antibodies to WNV indicating exposure.
- ❖ There are likely more WNV infections in mammalian wildlife than are currently understood since most mammals that become infected do not show clinical signs of disease.

### **Prevention:**

- ❖ There is a WNV vaccination available for horses.

### **Public Health Implications:**

- ❖ WNV is a significant health concern for humans.
- ❖ The most common means of infection in humans is through the bite of an infected mosquito.
- ❖ Each year, there are thousands of human cases in the U.S. peaking between July and October when mosquitoes are most active.<sup>1</sup>
- ❖ Humans are incidental or dead-end hosts as they can become infected but do not produce a level of virus in the bloodstream sufficient for mosquitoes to feed on an infected person and then transmit disease to another person or animal.

### **Clinical Signs:**

- ❖ The majority of individuals infected with WNV (~80%) do not have symptoms of disease and these cases are likely underreported.
- ❖ Symptoms typically occur 2-14 days after initial infection.
- ❖ Approximately 20% of individuals will have mild flu-like symptoms (fever, malaise, weakness, headache, body aches) and a skin rash on the body. The mild form usually resolves in a week but feelings of fatigue can last for weeks or months.

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<sup>1</sup> <https://www.cdc.gov/westnile/>

- ❖ Approximately 1% of individuals will develop a neuroinvasive form of disease that affects brain function and can have long-lasting effects or result in death. The neuroinvasive form is more likely in older patients with other health issues. The mortality (death) rate in those with the neuroinvasive form of WNV is approximately 10%.

**Treatment:**

- ❖ For any form of clinical disease, only supportive treatment is available.

**If you become ill with any of the described symptoms above and those symptoms do not resolve, consider seeking medical attention.**

**Guidance for Park Visitors:**

The guidelines below can be followed to ensure you and your family safely enjoy the wonderful natural and cultural resources protected by the NPS.

- ❖ Notify a Park Service employee as soon as possible and avoid contact with the animal if you see any sick or dead wildlife.
  - Most wild animals in parks are healthy and thrive in their natural environment, but sometimes wildlife can get sick just like people.
  - Some disease-causing organisms can be passed between wild animals and people. Therefore, always avoid touching or handling sick or dead wild animals.
  - Park Service employees trained in wildlife health use specific protective measures to safely deal with a wild animal that may have died of disease.
- ❖ Protect yourself from bug bites:
  - Wear insect repellent containing 20-30% DEET or other EPA approved repellent when spending time outdoors in flea and tick habitat.
  - Consider wearing permethrin treated clothing to provide additional protection.
  - Wear long pants and long-sleeved shirts when weather permits.
  - Minimize outdoor activity at dawn and dusk, when mosquito activity is highest.
  - Reduce sources for mosquito breeding and resting to reduce risk of disease transmission by removing any open containers and materials that can pool water.