NPS One Health Network News

National Park Service
U.S. Department of the Interior

Biological Resources Division &
Office of Public Health

2015: a record year for Tularemia and Plague

By LCDR Danielle Buttke

It was a normal day in the office; we were on a routine wildlife health call with a near-by park to discuss a management plan when, on an unrelated note, a biologist mentioned they had seen a few dead voles in the prairie dog colony. It was a wet year; everywhere, biologists were noting higher vole and mouse populations, and so it isn't unexpected to see more dead voles and mice too. But this wasn't a normal year. Earlier this summer we learned of a plague die-off of voles in a neighboring state, and were concerned that a zoonotic disease outbreak could be beginning in the park. The Wildlife Health Branch provides rapid diagnostic testing to parks, so the voles were immediately submitted to us for testing.

The vole tested negative for plague, but positive for tularemia, a disease that can impact both human and wildlife health and look similar to plague in some systems. The disease is of particular concern for wildlife biologists and anyone working outdoors in an affected area as the disease can occasionally be fatal in humans if left untreated. Educational posters were immediately posted in the park and an all-employee memo was sent educating employees and partners as to the risks and prevention measures for the disease.

Over the next two months, the Wildlife Health Branch and Office of Public Health worked together with the park, CDC, and State of Wyoming as wildlife and human cases from the area continued to be identified. A serosurvey of park employees was conducted to help identify human cases and risk factors for disease while a Wildlife Health Branch-led serosurvey of prairie dogs was conducted to learn more about the natural ecology of tularemia. This work represents the first study to evaluate wild prairie dog populations following a tularemia outbreak and provides new knowledge to help inform future risk reduction efforts and wildlife management options when tularemia appears again.

Through wildlife surveillance, tularemia was confirmed in 7 park units over the course of the summer, with suspected outbreaks in several others. A joint memo was issued by the associate directors of Natural Resource Stewardship and Science and Visitor

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In this Issue

New staff join Wildlife Health

On December 14, Nathan Galloway joined the Wildlife Health Branch as a wildlife biologist specializing in disease ecology. Nathan fills the position vacated by Ryan Monello. Nathan is concluding a PhD at Colorado State University investigating chronic wasting disease (CWD) and other risks to Colorado mule deer. He brings quantitative skills to apply to the ecology of wildlife diseases in the parks. Nathan has already begun work with an ongoing project tracking CWD in elk in Rocky Mountain National Park, but plans to broaden his research to include other disease systems. Nathan's research experience spans scientific approaches and scales: from experimental molecular biology of disease progression to observational field ecology of wildlife disease. Nathan_Galloway@nps.gov (970 267 2158)

Dr. Michelle Verant, DVM, PhD, MPH, joined the wildlife health branch January 25th. Dr. Verant fills the position vacated by Kevin Castle. Michelle just completed her PhD on white nose syndrome at the University of Wisconsin while working at the USGS-National Wildlife Health Center. She has experience with a diverse range of wildlife health and zoonotic disease issues, with a focus on white-nose syndrome (WNS) over the past several years. This emergent disease continues to threaten the conservation of hibernating bat species across North America, including populations residing within caves and mines of our National Parks. Outcomes of her research have been used to inform diagnostic techniques, surveillance and management strategies for WNS. Michelle_Verant@nps.gov

Chikungunya, dengue, and zika: more risks from exotic mosquitoes

By LCDR Danielle Buttke

If you feel as though there are more mosquito-borne disease threats in the US in previous years, you are right. Recent introductions of dengue and chikungunya virus have occurred in U.S. states and territories, and zika virus has appeared in some areas and is predicted to follow suit.

Chikungunya virus was first reported in American territories in 2014 and spread throughout South and Central American and the Caribbean in 2015. Chikungunya infections most commonly result in fever and joint pain; occasionally, rash, headache, and muscle pain can also develop. Symptoms usually resolve within a week and no deaths have been reported. Hawaii and American Samoa are currently experiencing dengue outbreaks. Symptoms of dengue are similar to those of chikungunya.

Local transmission of zika virus in the Americas was first confirmed in February 2014 on Easter Island, Chile. In May 2015, Brazil reported its first locally-acquired human case of zika virus disease. By the end of 2015, zika—a virus transmitted by the same mosquito species that can also carry dengue and chikungunya viruses—had spread to an additional12 other countries/ territories in South America, Central America, North America (Mexico), and the Caribbean . Local transmission has been confirmed in Puerto Rico, US Virgin Islands, and zika is anticipated to spread to other Caribbean islands over the coming months.

Zika-associated illness is typically mild and self-limiting, with either no symptoms or fever, red eyes, joint pain, and rash most commonly reported. However, scientists are currently investigating the link between zika virus infections during pregnancy and microcephaly and associated brain and nerve damage in infants. There has been a significant increase in the number of infants born or dying in utero with microcephaly since zika emerged in South America. Zika virus infection has been confirmed in many of those tested. South American countries have also experienced an increased number of Guillian Barre Syndrome (GBS) cases since zika virus emerged. GBS is a disease in which the immune system begins attacking the peripheral nerves, which can result in mild neurologic deficits to complete paralysis and need for ventilation. Most cases of GBS recover fully or partially with supportive care. The link between zika and GBS is still under investigation.

Zika, dengue, and chikungunya virus are all transmitted by the non-native mosquitoes *Aedes aegypti* and *Aedes albopictus*. They are maintained and transmitted in a human-mosquito cycle, with no other environmental reservoirs. Although wildlife are not infected with these diseases, mosquito management techniques such as the use of insecticides, can have implications for wildlife and natural resources. In Hawaii, feral swine are known to increase the amount of standing water in places due to their wallows, and thus feral swine may play a role in promoting populations of these non-native mosquitoes and diseases.

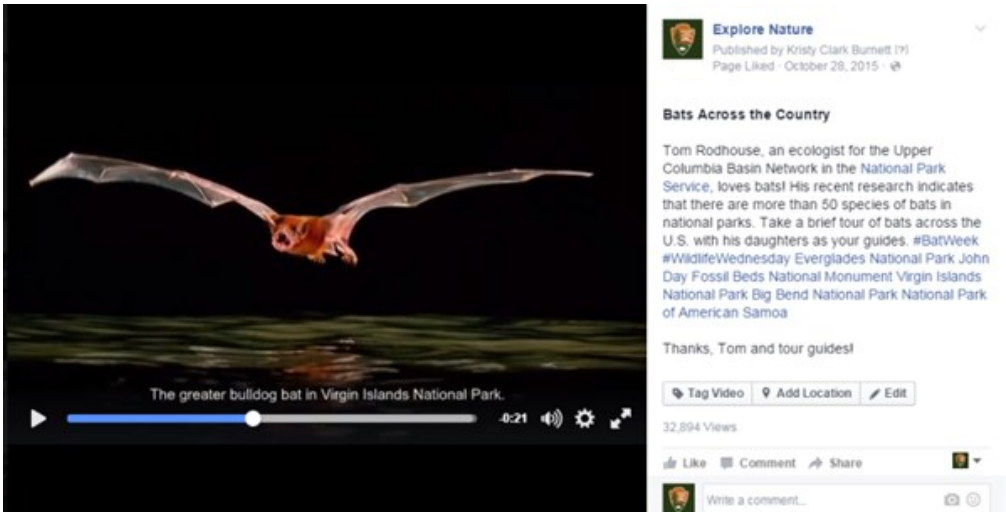
The mosquitoes responsible for zika, dengue, and chikungunya are very aggressive and bite during the day time. They prefer to breed in stagnant water, such as pots and containers near residences. Disease prevention therefore centers around the use of insect repellent, air-conditioning and screens in homes, and reduction of larval mosquito habitat by preventing standing water around the home.

Parks most at risk for these diseases include tropical and coastal parks, including Florida, Texas, the Caribbean, Hawaii, and other areas where *Aedes aegypti* and *Aedes albopictus* mosquitoes have been established.

The Office of Public Health has resources available for visitor and staff education about preventing these diseases.

White Nose Syndrome Communication Tools Available for Parks

By Kristy Burnett



This video posted on Facebook during Bat Week reached nearly 175,000 users and was viewed more than 30,000 times.

During the last week of October, #batweek took over many social media feeds and platforms. The interagency working group that addresses white-nose syndrome (WNS) of bats sponsored the second annual Bat Week. This week-long celebration raises awareness of bats and the threats they face as well as the many benefits they provide.

Many non-profit groups as well as federal and state agencies participated, including a tremendous response from many national parks. More than 80 parks delivered messages about bats and bat conservation during Bat Week. Park visitors and virtual visitors on social media had the opportunity to see photos and videos of bats and researchers, and they were able to learn about the important roles bats play in ecosystems throughout the Service.

But it's important to communicate about bats and WNS beyond Bat Week, too. To that end, the Biological Resources Division and Office of Education and Outreach have developed several communication tools parks can use to share information about WNS. Messages, downloadable templates, and resources for more information are available on the intranet site, http://nrintratest/brmd/wns/resources.cfm. This site will be regularly updated to reflect the most recent news and information about WNS.

WNS has killed millions of bats, including up to 100% of some bat colonies, since it was first discovered in the U.S. near Albany, N.Y., during the winter of 2006-2007. Scientists have identified the fungus *Pseudogymnoascus destructans* as the cause of WNS, named for the powdery, white substance that often appears around infected bats' muzzles and wings.

Now that more than half of the states in the U.S. has confirmed the presence of WNS, more and more park visitors are likely to ask questions about the disease. It is important for park staff to have access to current, updated information. The site above includes many tools that parks can choose from to fit their particular situations:

- Webpages about WNS that parks can easily link to instead of recreating this information on their individual sites
- An interpretive handbook that can be easily added to training manuals
- Decontamination card that puts screening before cave entry in plain language
- FAQs
- News release template/worksheet
- Talking points
- Fact sheet

The National Park Service actively protects bats and their habitats, implementing actions to reduce the risk of spreading the fungus that causes WNS into uninfected parks. These actions include providing extensive WNS education materials; screening visitors and gear; disinfection; and, when necessary, closure of cave resources.

Visit http://nrintratest/brmd/wns/resources.cfm and http://nature.nps.gov/biology/wns/index.cfm for more information about WNS and the available resources. Contact Margaret Wild Margaret_Wild@nps.gov, or your regional WNS coordinator if you have any questions.

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Tularemia

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and Resource Protection to the Midwest and Intermountain regions, educating parks as to the risks and prevention measures necessary to prevent human disease. More human tularemia cases were reported in 2015 than any other year on record, and the One Health program at NPS played an integral role in responding and contributing to the science that will guide future responses to this recurring and increasingly important zoonotic disease. This response highlights the importance of working closely with park managers, thorough and expert diagnostic investigation (what if we had only tested for plague?), and the value of interdisciplinary response and inter-directorate collaboration– One Health in action.

Fast Facts about Tularemia:

Tularemia is thought to be a native bacterial disease most commonly affecting rodents (voles, muskrats, beavers) and rabbits.

- Tularemia can be transmitted in a number of ways, including deer fly bites, ticks, inhaling bacteria (most often hunting or mowing over an infected carcass), or consuming contaminated food or water.
- Symptoms vary depending on route of exposure: a non-healing ulcer at the site of a fly or tick bite if bitten by an infected arthropod, non-productive cough if bacteria was inhaled, and high fever and aches regardless of the route of exposure. Tularemia can be treated with antibiotics and is occasionally fatal if left untreated.
- Outbreaks in wildlife are typically localized and self limiting. Humans can protect themselves from tularemia by wearing insect repellent or insect-protective clothing, avoiding contact with carcasses, and only consuming treated water.
- Tularemia can reappear in an affected area after several years of no activity, and can mimic and overlap with plague. Carcass testing can help to identify and respond to outbreaks quickly.

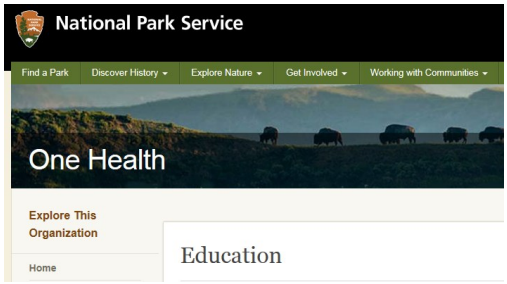
Fast Facts about Plague

Plague was also detected in 3 NPS units in 2015, with 17 human cases across the U.S., the highest case count since 1985. Plague is an exotic bacterial disease introduced into the United States in 1900 and responsible for large-scale human outbreaks until 1924 and significant declines in many wildlife populations. Since then, it has become endemic in wildlife, with an average of 3-7 human cases every year. Seventeen human cases and numerous wildlife outbreaks were reported in 2015. Given this increase in activity and el nino, increased plague activity is more likely this year as well.

- Plague is most often transmitted to humans and animals through the bite of an infected flea. Humans also become infected through close contact with infected carcasses or respiratory droplets from an infected animal, most often a pet cat.
- Symptoms appear 2-6 days after exposure, and begin with high fever and swelling at a lymph node nearest the flea bite. Individuals exposed to infectious respiratory droplets will develop symptoms within 24-48 hours after exposure and begin with fever and cough, often with blood-tinged sputum. This type of plague is most often fatal due to the rapid progression.
- Plague is successfully treated with antibiotics, but most often fatal if antibiotic are not given in time.
- Plague is fatal to most wildlife species. Human risk of plague is highest when animals have died from plague and their fleas go looking for a new host.
- Humans can prevent plague by wearing insect repellent, long pants and boots, and avoiding contact with animal carcasses. Keep pets leashed and current on a flea and tick preventative. Avoid pitching tents or hiking near rodent burrows.
- Managers can apply insecticide dust to rodent burrows in areas where active plague is occurring in consultation with the IPM program. Prevention of plague is more challenging; the Wildlife Health Branch is working with USGS and other agencies to develop and test an oral vaccine for wildlife to protect both wildlife and human health. This vaccine has shown promise for protecting prairie dogs and the endangered black-footed ferret, both of which have seen significant declines from plague.

Zoonotic diseases like plague and tularemia are only one example of how human, wildlife, and environmental health are interlinked, and why all species benefit when different disciplines collaborate.

Zoonotic Disease resources now online



By LCDR Danielle Buttke

Messaging about zoonotic disease is challenging and has the potential to make people afraid of nature, which is why it must be done carefully and in a balanced way. The One Health program is conducting research to better understand how people perceive public health risks involving wildlife and to learn how we can both educate people about disease prevention and promote conservation values and appreciation of wildlife.

The One Health program has developed educational resources about zoonotic disease prevention that provides context for these risks and promotes conservation ethic. They can be downloaded from our website at http://www.nps.gov/orgs/1632/education.htm. Printer-friendly, 508 compliant fact sheets are available for the following:

- Tick-borne diseases
- Water-borne diseases
- Mosquito-borne diseases
- Rabies
- Tularemia
- Hantavirus
- Harmful algal blooms
- Histoplasmosis
- Health benefits of nature and biodiversity

Requests for additional topics are welcome!

OneHealth

One Health Network: Partners in Health

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Interested in collaborating in One Health?
Please contact the One Health Coordinator, Danielle Buttke, at Danielle_Buttke@nps.gov or 9790-267-2118.

More One Health!

A recent publication in PNAS and highlighted in *Science News* conducted a broad-scale meta-analysis of over 200 assessments and found 'overwhelming evidence' supporting the dilution effect. The dilution effect is the hypothesis that disease systems with variations in host competence, host resilience, and non-density-dependent transmission, biodiversity can decrease infectious disease risk. The dilution effect has been hotly debated and studied for its promise for conservation: if biodiversity does indeed protect humans and animals from infectious disease, it provides another argument for protecting natural spaces and resources. The meta-analysis is available electronically here: http://www.pnas.org/content/112/28/8667.abstract.

An international One Health journal was recently established and is currently soliciting articles for peer review: http://www.onehealthjournal.org/

A One Health Newsletter is also published by the One Health Initiative and available at: http://www.onehealthinitiative.com/newsletter.php.