



**Report to the AFWA Fish and Wildlife Health Committee
Wildlife Disease Issues of Interest to State Managers and Directors
from the
USGS National Wildlife Health Center
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Field Investigation Team Summaries: January – August 2008

White-Nose Syndrome in Bats (CT, MA, NY, VT)

Investigations continue into the cause of a mysterious illness that has resulted in the deaths of over 200,000 bats since the winter of 2006–2007. At more than 30 caves and mines in the northeastern U.S., bats exhibiting a condition now referred to as "white-nose syndrome" have been dying. The USGS National Wildlife Health Center issued a Wildlife Health Bulletin in April 2008 advising wildlife and conservation officials throughout the U.S. to be on the lookout for this condition and to report suspected cases. A Wildlife Disease Specialist from the USGS National Wildlife Health Center (NWHC) met with biologists in Vermont, New York and Massachusetts in March 2008 and collected environmental samples from affected caves and mines.

Since February 2008, the NWHC has received over 100 bat carcasses, both euthanized and recently dead. Species included little brown myotis, big brown bats, northern long-eared myotis, and tricolored bats. The majority of the bats were from New York, Vermont, Massachusetts, and Connecticut.

A common finding among the bats examined has been emaciation and poor body condition; many had little or no body fat. A majority of bats also suffered from fungal infection of wing membrane, muzzle, and/or ear skin. A fungus believed to cause the white-nose syndrome-associated skin infection has been isolated, and work is currently underway to further characterize this organism. Investigations are also underway to identify potential underlying environmental factors, secondary microbial pathogens and/or toxicants that may contribute to white-nose syndrome.

**Unusual Behaviors Reported in Summering Bats from the Northeastern U.S.
(NY, VT, NH, CT, MA)**

Increased numbers of calls to public health departments from citizens are being reported this summer in the northeastern U.S. Bats are being observed persisting in the open during daylight hours, increased numbers of live pups are falling to the ground at maternity roosts, and there have been two reports of pup abandonment. Anecdotal reports from several areas indicate a reduction in colony size compared to previous summers. State Rabies Labs of NY and CT report decreased numbers of *Myotis lucifugus* (little brown bat) submissions, the species with the highest winter mortality estimates during the peak of White Nose Syndrome (WNS), compared to previous summers. Summer bat surveys are assessing individuals for wing lesions thought to be a sequela of bat white-nose syndrome. The NWHC is requesting fresh, intact bats found dead on the landscape from any state where mortality rates within a well-defined area and time period exceed the expected background mortality. In addition, individual bats with wing

membrane lesions are being sought for examination. Contact your local state wildlife agency to report unusual mortality events and to arrange submission.

Type E Botulism Claims Thousands of Birds in 4 of 5 Great Lakes during 2007 (MI, WI, OH, PA, NY)

As in recent years, botulism type E was responsible for the mortality of waterbirds resident to and migrating across the Great Lakes during the summer and fall of 2007. Botulism type E was detected in a small sample of the 17,125 dead birds collected on the shores of Lakes Ontario (June – December; 3,738 carcasses), Erie (July – December, 9,175 carcasses), Huron (September – December, 54 carcasses), and Michigan (June – December, 4,158 carcasses). The top 5 affected species were the common loon (11,503), long-tailed duck (954), ring-billed gull (844), double-crested cormorant (619), and Herring gulls (353). Peak mortality occurred during October through December 2007 as fish-eating birds migrated southward, but there were avian botulism type E mortalities during the entire June to December period, including the death of 4 endangered piping plovers at Sleeping Bear Dunes National Lakeshore. The characteristics of the 2007 event were similar to botulism type E outbreaks that have occurred annually in at least one of the Great Lakes since 1998. Carcasses have been received by NWHC for confirmation of botulism type E so far in 2008 from Lakes Michigan (MI) and Erie (PA).

Two NWHC scientists attended the Great Lakes Botulism Coordination Workshop in Detroit, MI, in June 2008, and participated in a Federal Agency panel that discussed lessons learned, anticipated projects, and needs identification. The objective of the workshop was to foster collaboration and generate new management ideas in response to Type E botulism outbreaks across the Great Lakes Basin.

Laysan Duck Mortality Due to Avian Botulism Type C (HI)

A recent die-off of Laysan ducks occurred at Midway Atoll National Wildlife Refuge during August 2008. Laysan ducks are a federally endangered species. About 136 ducks are estimated to have died out of a population of 400 on 3 separate islands in the atoll. Preliminary diagnosis of avian botulism was made in the field by USGS scientists and confirmed in samples sent to the National Wildlife Health Center. Avian botulism is a common cause of mortality in waterbirds during the summer during high temperatures when wetlands have low oxygen conditions. The U.S. Fish and Wildlife Service is managing the outbreak by draining a catchment basin and refilling it with fresh water. The Laysan duck population on Midway Atoll was introduced in 2004 from Laysan Island where there are an estimated 600 ducks in an isolated population. Midway Atoll National Wildlife Refuge is home to nearly 2 million birds, including the Laysan albatross and 16 other seabird species.

Virulent Newcastle Disease Virus Diagnosed (MN)

The USGS National Wildlife Health Center (NWHC) is investigating double-crested cormorant mortalities from multiple counties in Minnesota since first being contacted by MN DNR biologists in mid-July 2008. The USDA National Veterinary Services Laboratory confirmed virulent Newcastle disease from samples submitted by NWHC in dead double-crested cormorants from northern and central Minnesota. This is a highly contagious disease among birds and is especially threatening for the poultry industry. To date, an estimated 50 nestlings of 150 hatchlings have been found dead at Voyageurs National Park and over 500 cormorants from Meeker County. Currently, the NWHC has detected avian paramyxovirus-1, the precursor to virulent Newcastle disease, in 3 additional MN sites. NWHC staff are working with officials from Voyageurs National Park, Minnesota Department of Natural Resources, the Minn. State Veterinarian's office, and the USDA to manage the outbreak to reduce the possible impact of the virus to both wild birds and to poultry in the affected areas. Because one case is located at Voyageurs National Park, which straddles the U.S.-Canada border, NWHC has also been in close contact with the Canadian Cooperative Wildlife Health Center about this evolving situation.

Avian Cholera Outbreaks in the Central, Mississippi, and Pacific Flyways (NM, KS, NE, MO, IA, TN, CA)

Mortality events in waterfowl attributed to avian cholera are more commonly reported in the winter months when flocks are stressed from seasonal migration and reduced food resources. Substantial outbreaks of avian cholera had not been seen in the Mississippi and Central Flyways for several years. Snow geese were a primary species involved and are known carriers of the bacterial agent of avian cholera, *Pasturella multocida*. Other species affected included Ross' and greater white-fronted geese, with multiple species of waterfowl (mallards, northern pintails, teal, etc.). In autumn 2007 and spring 2008, disease events occurred in several locations including Bosque del Apache National Wildlife Refuge in New Mexico, with estimated losses of 4,000 birds. Known mortality totaled over 2,300 snow geese and 473 Ross' geese. Other areas with substantial losses included Lake McKinney (Kearny Co.) in western Kansas with 550 birds dying, and several waterfowl production areas in the Rainwater Basin Wildlife Management Area in Nebraska losing about 600 birds. Outbreaks occurred at Rush Lake (Palo Alto Co.) in Iowa (mortality of 224 birds); Mississippi Co., Missouri (75 birds); and Black Bayou Refuge, Lake Co., Tennessee (50 birds).

Annual outbreaks are common in the Pacific Flyway, but this year had multiple areas affected. Avian cholera mortality began in several counties in California in mid-December 2007 through March 2008. The most commonly afflicted species is American coot, but ruddy ducks, green-winged teal, wigeon, mallard, northern pintail, snow geese, white-fronted geese, and trumpeter swans have been affected. Aleutian Canada geese, removed from the endangered species list in 2001, were involved at the avian cholera outbreak at San Joaquin National Wildlife Refuge in Stanislaus County. USFWS Refuge staff collected 1194 Tundra swans and 1164 northern pintails on Lower Klamath NWR with more than 410 birds collected from Tule Lake NWR. Tundra swan mortality due to avian cholera had not been reported since 1999. Other refuges with avian cholera outbreaks include Butte Sink NWR in Sutter County, Colusa NWR in Colusa County, Sacramento NWR in Glenn County, Salton Sea NWR in Imperial County, Lower Klamath NWR and Tule Lake in Siskiyou County. California Department of Fish and Game investigated mortality in Del Norte, Humboldt, and Sutter Counties and in the San Francisco Bay area. Mortality estimates for all outbreaks was over 10,000 birds. Scavenging activity by bald eagles likely reduced the number of carcasses reported. Occasional bald eagles were confirmed to be affected by avian cholera over the past two years.

Unusual Mortality in Red-tailed Hawks from Chlamydiosis (CA)

Mortality investigations by San Diego County veterinarians and CA Dept of Fish & Game have confirmed *Chlamydiophila* bacteria in red-tailed hawks in southern California coastal counties. The first reports of sick hawks that were emaciated and not responding to treatment came in mid-January from wildlife rehabilitators in San Diego County. Chlamydiosis also is known as Parrot fever, psittacosis, and ornithosis. It is not commonly reported in raptors. The infectious bacteria can be spread by fluids and excreta, particularly when materials dry and the bacteria become airborne. Chlamydiosis can be a serious human health concern and should be mentioned to a treating physician by anyone that handles infected birds.

Elk Mortality from Lichen Poisoning in Red Rim Area of Wyoming (WY)

Nearly 80 elk found sick and unable to stand were euthanized in the Red Rim area near Rawlins spring 2008. Elk were thought to have eaten a lichen, *Xanthoparmelia chlorochroa*, that produces a toxic metabolite. Affected elk initially produce red urine. Severely afflicted animals are alert, but not able to stand prior to death. The first reported occurrence of lichen poisoning of this type was an event in 2004 that killed more than 400 elk. Both 2004 and 2008 were particularly harsh winters that may have contributed to elk searching out new sources of forage. Researchers with Wyoming Game and Fish and University of Wyoming have examined the incidents.

Enteritis in American Crows USA (multiple states)

Since late December 2007, deaths among American crows associated with a reovirus-like virus have been observed in five states: New York, Massachusetts, Iowa, Ohio, and New Jersey. Low mortality in crows with enteritis and isolation of reo-like viruses has been diagnosed at the NWHC nearly annually since 2001. Other states with a history of crow enteritis mortality include KY, MD, WA, WI, KS, PA, MO and the District of Columbia. Although pathogenicity tests have not yet been performed, it is speculated that the virus replicates in the intestines, and is transmitted through the feces. The disease seems more common at winter roost sites, although it has also been seen sporadically in summer and fall.

Salt Toxicosis Results in Duck Mortality at White Lake, North Dakota (ND)

Birds with excessive salt encrusted on their feathers were discovered by USFWS personnel at White Lake in Mountrail County, North Dakota in late June. Affected birds were alert and moving their wings, but were unable to fly. Mortality was estimated at 110 birds with Mallards, Gadwall, Eared Grebes, Ruddy Ducks, Franklin's Gulls, Green-winged and Blue-winged Teal, Northern Shovelers, American Wigeons, and American Coots affected. Shorebirds in the area did not appear to be impacted. White Lake is a large, alkaline lake with a former salt mine nearby. Euthanized and freshly dead birds had brain sodium levels between 1,370-1,700 ppm, wet weight. Salt acts as a preservative against carcass decomposition so older mortalities (possibly >1-year-old) have been observed at this lake. In 1985, a die-off occurred at this same location after cold temperatures made fresh water from other lakes unavailable.¹ Salt toxicosis also has occurred during summer months in hypersaline lakes where birds were affected in less than 5 hours of entering the water.²

1. Windingstad, R.M., F. X. Karch, R.K. Stroud, and M. R. Smith. 1987. Salt toxicosis in waterfowl in North Dakota. *Journal of Wildlife Diseases* 23:443-446.

2. Stolley, D.S. and C.U. Meteyer. 2004. Peracute sodium toxicity in free-ranging Black-bellied whistling ducks. *Journal of Wildlife Diseases* 40:571-574.

Ranavirus returns to Washington County (RI)

Between mid-May and mid-June, Wood Frog tadpoles, Marbled Salamander larvae and Spotted Salamander larvae were found sick and dead in some Washington County ponds monitored by the University of Rhode Island's Department of Natural Resource Science. It is estimated that 80,000 amphibians have died, including nearly all of this year's cohort. Sick animals were lethargic and had hemorrhagic lesions in the ventral skin. Subsequent virus isolation of the skin, liver and kidney determined that these amphibians died from a Ranavirus sp. This virus has been the primary cause of several amphibian mortality events in various ponds through out the County since 2001.

Trematodiasis at the Upper Mississippi River National Wildlife & Fish Refuge (WI & MN)

Migrating waterfowl have been found sick and dead on the Mississippi River's Pools 7 and 8 again this spring. US Fish & Wildlife personnel collected 1,312 birds and estimated there were 2,210 – 2,580 dead with American Coots and Lesser Scaup comprising 99% of the mortalities. Infections by the trematodes *Cyathocotyle bushiensis* and *Sphaeridiotrema globulus* were identified in chilled carcasses submitted to NWHC. These parasites are found in the lower intestines of infected birds and cause severe blood loss, electrolyte imbalance, and penetrating damage to the intestinal wall leading to death. An estimated 32,000 migrating waterfowl at the refuge have died as a result of trematodiasis since 2002.

Exotic Parasite Discovered in Mississippi River (WI, MN)

In June 2007, scientists at the USGS National Wildlife Health Center (NWHC) discovered *Leyogonimus polyoon*, an exotic parasitic trematode affecting American coot, in exotic faucet snails collected from the Upper Mississippi National Wildlife and Fish Refuge, near La Crosse, Wisconsin. Based on data from 2004–2006 surveys, *L. polyoon* was not present in the Upper Mississippi River until 2007. The life cycle of *L. polyoon* involves the exotic faucet snail (*Bithynia tentaculata*) and various species of aquatic insect

larvae, such as dragonflies and damselflies. The American coot is the only natural definitive host thus far reported to be susceptible to infection in North America. Coot fall victim to the parasite by feeding on infected insect larvae. The snail and parasite are native to Eastern Europe. In the United States, coot and aquatic insects are widely distributed, so control of the parasite will focus on controlling the snail. This snail and parasite were found in the Rabbit Flowage of Lake Winnibigoshish in **August 2008** while NWHC and MN DNR scientists were conducting snail and parasite surveys.

Second Year of Mortality from Non-Native Parasites in Montana (MT)

In mid-September 2007 and for the second consecutive year, significant mortality due to parasites has been observed in American coots on Georgetown Lake (Deer Lodge County; mortality ~1500) and Smith Lake (Flathead County; mortality ~200). The estimated mortality on Georgetown Lake is higher than the mortality estimates in 2006. American coots examined at the NWHC had intestinal impactions and were found to be infected with the trematode *Cyathacotyle bushiensis*. The intermediate host of this parasite is the non-native faucet snail (*Bithynia tentaculata*). Coccidia spp., a protozoan parasite, was also reported in birds from this event.

Rattlesnake Reservoir (Yellowstone County; mortality ~100), outside of Billings, had mortality between March and April 2008 in multiple duck species from *Sphaeridiotrema globulus*. *Sphaeridiotrema globulus* has been identified in this lake in previous years and it also utilizes the non-native faucet snail as an intermediate host. NWHC parasitologists and Montana Fish, Wildlife, and Park plan to sample snails for parasites at several locations this summer.

Sage Grouse and West Nile Virus (CO, ID, MT, NV, ND, OR, SD, WY, UT, CA)

Overall, West Nile virus (WNV) mortality has now been reported in sage-grouse in California, Colorado, Idaho, Montana, Nevada, Oregon, North Dakota, South Dakota, Utah and Wyoming, as well as Alberta, Canada. Experimental studies at the USDA National Wildlife Research Center have shown that WNV is usually fatal to sage-grouse, resulting in death within 6 days of infection, although antibody to the virus has been found in live wild sage-grouse. In FY-08, the National Wildlife Health Center is continuing the investigation of WNV in greater sage-grouse, passerines, and wild horses in Nevada and Oregon, as part of a USGS sagebrush biome research program.

Plague Outbreak in Conata Basin, South Dakota

On May 15, 2008, sylvatic plague, a bacterial disease transmitted by fleas, was confirmed in prairie dog colonies in the Conata Basin Area. The U.S. Fish and Wildlife Service (FWS) indicated that about 9,000 acres of prairie dog habitat have been affected as of June 19, and that some of the affected areas include colonies occupied by black-footed ferrets. To help increase ferret survival during this outbreak, biologists from an NGO are working with FWS to vaccinate wild ferrets to provide immunity if they become exposed to plague. The plague vaccine was developed for humans by the U.S. Army Medical Research Institute for Infectious Disease and is being tested for animals at the USGS NWHC in Madison, Wisconsin.

H5N1 Highly Pathogenic Avian Influenza

The Federal, State and Tribal partnership formed to develop and implement the National Interagency Early Detection System for Highly Pathogenic H5N1 Avian Influenza in Wild Migratory Birds has continued into the third year of surveillance. Birds have been tested from all 50 states and 6 freely-associated states and territories. While the surveillance focused on waterfowl, shorebirds, gulls and terns, a total of 284 species were sampled. During the 2007 sampling year (April 1, 2007 – March 31, 2008) cooperating agencies collected and analyzed over 90,000 wild bird samples and the highly pathogenic avian influenza H5N1 virus was **not** detected.

Up-to-date information on the U.S. wild bird surveillance program, reported to the HEDDS database, can be seen at: <http://wildlifedisease.nbio.gov/ai/>. Another program that USGS is involved with is GAINS, a global surveillance network of wild birds for avian influenza. More information is available at <http://www.gains.org/>

Chronic Wasting Disease (CWD) Research

Susceptibility of various small rodent species to CWD

The susceptibility of various small rodent species to CWD has and is being examined by intra-cerebral challenge studies at the NWHC. Meadow voles (*Microtus pennsylvanicus*) are very susceptible to intra-cerebral CWD challenge, with 100% penetrance and a median post-challenge survival time of 270 days. The incubation period shortens significantly upon second passage. Deer mice (*Peromyscus maniculatus*) and white-footed mice (*P. leucopus*) have proven to be relatively resistant to the disease, although resistance is not complete. Red-backed voles (*Myodes gapperi*) challenge studies are still underway, but appear to be no more susceptible than meadow voles. Experiments are being initiated with the University of Wisconsin to further explore the implications of voles' susceptibility to CWD, especially the likelihood of voles acquiring infections via natural routes.

Persistence of CWD prions and factors affecting their degradation

An environmental reservoir of infectivity contributes to the natural transmission of chronic wasting disease (CWD) and a growing number of studies suggest that soil serves to preserve infectivity and potentially spread disease. A general paucity in the understanding of the fate of CWD agent (prions) in the environment as well as the mechanism of environmental CWD transmission limits disease management and control efforts. The goal of this study is to test the hypothesis that the fate of prions in the environment is affected by soil, plants and microbes. Results from these studies can provide insight into the mechanisms of CWD transmission in the environment and potentially provide methods for bioremediation of prion-contaminated soil.

Statistical spatial-temporal epidemiological models of CWD

In conjunction with the Wisconsin Department of Natural Resources and other partners, the NWHC has been developing statistical spatial-temporal epidemiological models of CWD epidemics in free-ranging cervids. Substantial progress has been made in developing new statistical "backcasting" models based on dynamic process theory that allow the estimation of the rates at which the disease is growing and spreading. The analyses have discovered that substantial fine-scale spatial heterogeneity exists in infectivity, and spatial patterns in infectivity seem quite stable over time.

The NWHC thanks all the state, federal and tribal agencies who worked with us the past year. We are at your service to provide technical support, field investigation assistance and diagnostic capabilities as your needs dictate.

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