

Identifying Roadblocks to Recovery

by J. Christian Franson

Knowledge of wildlife health-related issues is critical to the restoration of many endangered species. Since the establishment of the National Wildlife Health Center (NWHC) in the mid-1970s, its pathologists have conducted more than 8,500 necropsy evaluations of endangered species carcasses to identify causes of mortality. Although birds comprise the major species group investigated at NWHC, a variety of taxa, including

individuals of nearly 1,000 endangered mammals and over 900 amphibians and reptiles, also have been examined.

The NWHC is a U.S. Geological Survey facility in Madison, Wisconsin. Data gathered from cause of death determinations are interpreted by NWHC scientists, providing a resource to address existing and emerging health issues of listed species, and forming a basis for recommendations in recovery plans

Necropsy of a whooping crane at the USGS National Wildlife Health Center.

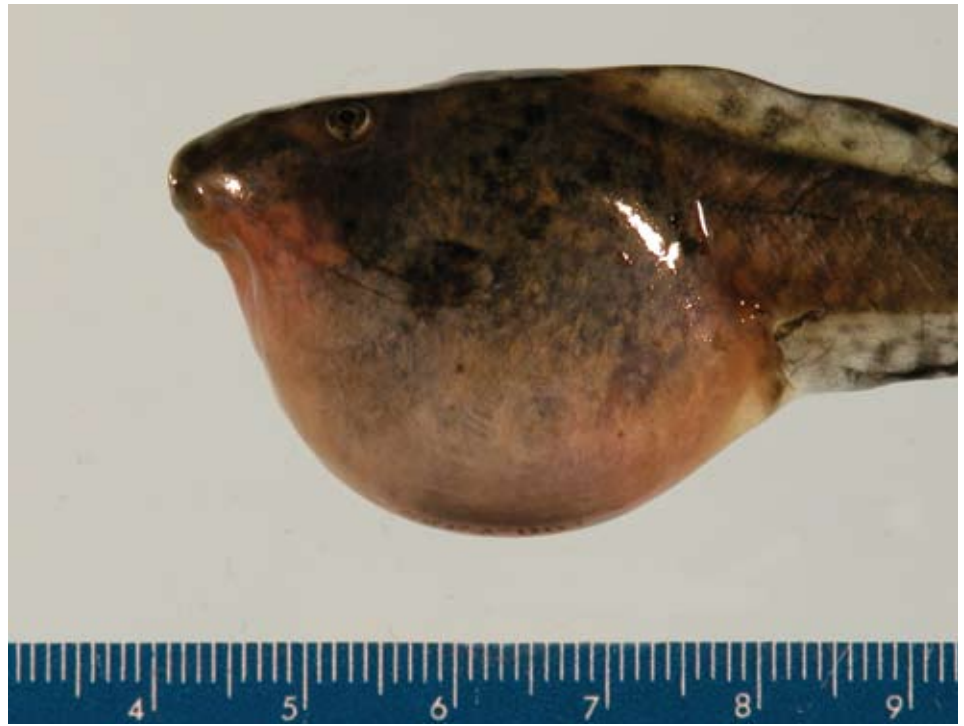


Nathan Ramsay/USGS

and management actions. The NWHC conducts most of its work throughout the U.S. and six freely-associated states and territories in the Pacific Basin. However, NWHC scientists are also asked to consult on problems abroad, such as the recent identification of mortality and population declines of endangered vultures in Pakistan associated with feeding on dead livestock that had been treated with an anti-inflammatory drug (see <http://www.nature.com/nature/journal/v427/n6975/full/nature02317.html>).

For many years, the NWHC has investigated disease in high-profile species, such as the bald eagle (*Haliaeetus leucocephalus*), gray wolf (*Canis lupus*), red wolf (*C. rufus*), southern sea otter (*Enhydra lutris nereis*), whooping crane (*Grus americana*), and Mississippi sandhill crane (*G. canadensis pulla*). Data from these investigations have been used as the foundation for legislation and mitigation practices to reduce mortality from poisonings by pesticides and metals, electrocution and trauma from power line strikes, vehicular impacts, and a variety of infectious diseases that impeded recovery efforts. A brief summary of some health issues of concern for endangered species are listed below:

Plague and the black-footed ferret (*Mustela nigripes*) Sylvatic plague, caused by the bacterium *Yersinia pestis* and transmitted by the bites of fleas, has hampered efforts to restore black-footed ferrets to their historical range. Laboratory experiments at NWHC demonstrated that vaccinated black-footed ferrets survived ingestion of plague-infected mice, and field trials have shown that survival of vaccinated ferret kits was twice that of unvaccinated kits. Efforts are being made now to vaccinate all black-footed ferret kits released as part of the recovery program. Plague can also decimate black-tailed prairie dogs (*Cynomys ludovicianus*), the ferret's preferred prey. Experimental trials at the NWHC indicated that more than 50 percent of immunized prairie dogs survived plague transmission from four



Mississippi gopher frog tadpole with distended abdomen caused by a yet to be named protozoan.

D. Earl Green/USGS



A Chiricahua leopard frog with reddened feet caused by chytrid fungus infection.

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to five flea bites. The NWHC is currently testing an improved vaccine in prairie dogs and evaluating appropriate baits for field use.

Diseases of amphibians and reptiles

In recent years, the NWHC has diagnosed various viral, bacterial, fungal, and parasitic diseases affecting endangered amphibians and reptiles. One of the most severe is chytrid fungus (*Batrachochytrium dendrobatidis*), which has caused amphibian mortality



Necropsy of a gray wolf at the USGS National Wildlife Health Center.

associated with population declines in many areas of the world. (See examples in http://www.fws.gov/endangered/bulletin/2008/bulletin_spring2008.pdf). A recently discovered disease, caused by a yet to be named protozoan, also has affected amphibians in the eastern U.S., including the Mississippi gopher frog (*Rana sevosia*).

Humpback chub (*Gila cypha*) Surveys by the NWHC, in collaboration with the Arizona Game and Fish Department and the USGS Grand Canyon Monitoring Center, have revealed the presence of the Asian fish tapeworm (*Bothriocephalus acheilognathi*) in the Little Colorado River, the primary remaining spawning area of the endangered humpback chub. Although all fish in the Little Colorado were infected, the humpback chub hosted 54 percent of the tapeworm infections. It is unknown if the parasite has contributed to the decline of the humpback chub population, but experimental infections at NWHC of the endangered bonytail chub (*Gila elegans*), a close relative of the humpback, resulted in increased mortality and decreased growth. Surveys by NWHC have found the Asian fish tapeworm in four of eight tributaries

of the Colorado River, information that should be valuable for evaluating potential fish relocation projects within the canyon. Because the tapeworm has been found in the warmer tributaries of the Colorado River, it will be important to monitor water temperature changes and any effects temperature control devices at the Glen Canyon Dam might have on the spread of this parasite into the main stem of the river.

Pacific marine species

The NWHC's Hawaii Field Station (HFS) was established in 1992 to provide technical assistance, diagnostic services, and disease surveillance support for wildlife health issues in Hawaii and the Pacific. In recent years, the HFS has devoted increased emphasis to such marine species as corals, urchins, fish, sea turtles, and marine birds. The HFS routinely works with the Fish and Wildlife Service, National Marine Fisheries Service, and the State of Hawaii (among many other agencies) to accomplish its mission. Recent activities include:

- **Laysan duck (*Anas laysanensis*):** The HFS collaborated on an inter-agency project involving translocation of the Laysan duck from Laysan Island to presumed former habitat on Midway Atoll National Wildlife Refuge, providing help in identifying and understanding mortality factors and monitoring the health of translocated ducks (see http://www.fws.gov/endangered/bulletin/2007/2007_highlights.pdf).
- **Green sea turtle (*Chelonia mydas*) tumors:** The HFS is collaborating with the National Marine Fisheries Service to investigate the possible causes of green sea turtle fibropapillomatosis (FP), a tumor disease affecting threatened green turtles in the Pacific. A herpes virus is associated with the disease, and turtles with FP are immuno-suppressed, but it is unknown if the virus causes FP. Current efforts include the development of tests to detect the virus in the host and the environment.

- **Disease of corals:** Corals are subject to a variety of diseases that have contributed to the decline of coral reef cover in some areas of the world. The HFS is evaluating biomedical methods to assess the health of coral, including *Acropora palmata*, which has been proposed for listing under the Endangered Species Act. Working collaboratively with the Fish and Wildlife Service, National Park Service, National Oceanic and Atmospheric Administration, and others, the HFS has led reef health surveys targeted to understanding the pathology and pathophysiology of coral diseases in the Pacific Basin.

The NWHC will continue its support of the Endangered Species Program by serving as a resource for diagnostic services and consultation on wildlife health problems. Please visit our website (<http://www.nwhc.usgs.gov/>) for further information.

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The NWHC's Hawaii Field Station is investigating diseases of corals in the Pacific Basin.



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