



DoD Amphibian Disease Survey Do Frogs Still Get Their Kicks on Route 66?

Project # 09-426

Background:

Amphibians play an essential role in the ecosystems of Department of Defense (DoD) lands. The fungal disease chytridiomycosis, caused by *Batrachochytrium dendrobatidis* (Bd) is a major cause of many amphibian population declines and extinctions worldwide. Limited amphibian disease surveys for Bd have occurred on DoD lands to date. Successful management and control of these diseases requires effective surveying to detect their presence/absence, an understanding of their distribution and frequency, and preparation to respond to outbreaks. We proposed a large-scale survey to determine incidence and potential impacts of Bd on amphibians on 15 DoD installations in the USA.

Objective:

The objectives of this investigation were to answer the following questions: 1) Does Bd occur in amphibian populations in the relatively undisturbed environments of military installations? 2) Is there a spatial pattern to the presence of Bd? 3) Is there a temporal pattern to the presence of Bd? and 4) Do our results shed light on whether Bd is acting as an epidemic or endemic infection across North America? This study represents the most geographically extensive survey, to our knowledge, for Bd infection conducted to date.

Summary of Approach:

With funding from the DoD Legacy Program, we conducted surveys along a transcontinental transect designed to sample for the presence of Bd on United States DoD installations from west to east along U.S. Highway 66 from California into central Illinois, and continuing eastward from there across to the Atlantic Seaboard along U.S. Interstate 64. We sampled three wetland habitats on each of the 15 installations three times in 2009 during the following seasons: 1) spring/early summer; 2) mid-summer; 3) late summer/fall. A team of over 15 people comprised of PARC members, DoD biologists/environmental managers and volunteers conducted the field work for this project. We followed a non-invasive protocol for capturing and swabbing amphibians to ensure consistency in data collection and to prevent the transfer of Bd, if present, from one amphibian to another and from one installation to another.

Benefit:

This study sought to answer whether Bd is present on the surveyed DoD installations; whether sampled amphibians show signs of the disease chytridiomycosis; which amphibian species are carriers of the disease; and which amphibian species are most vulnerable to population declines from the disease (including T&E species). Answers to these questions will benefit the individual missions of the installations by 1) assisting with the management, and aid in preventing population declines, of listed species, thus avoiding new restrictions on current missions; 2) providing baseline data on the health of amphibian populations (and general health status of the ecosystem); 3) minimizing, to the extent possible, the impacts of emerging diseases that may result in population declines and thus additional regulations on currently common amphibian species; 4) assisting in defining mitigation opportunities or liabilities (e.g., areas with, or without amphibian disease detected), so that corrective actions can be taken to remove sensitive or endangered species from further contact with amphibian pathogens; and 5) raising awareness about this disease. The DoD-wide significance of this study is the minimizing of negative impacts to military readiness as a result of degrading ecosystem health (amphibian population die-offs and declines), and this study will raise awareness about the disease.

Accomplishments:

In 2009, we sampled a total of 15 DoD installations. 1,306 amphibians were sampled for this project, 217 (16.6%) swabs tested positive for Bd. We did not detect Bd at two bases, Camp Navajo, AZ and Fort Sill, OK. Infection rates among all other installations ranged from 2% to 39% of sampled amphibians per installation. Species infected with Bd covered a wide range of species including four species of salamanders, three species of toads, nine frog species (including tree frogs and chorus frogs). At no point during this study did we observe dead or dying amphibians.

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Figure 1. Department of Defense installations participating in the present study. From California to Illinois, bases were located near Route 66; from Illinois east to the coast, sites were chosen near Interstate 64 to hold latitude relatively constant (between 33° and 39° N).

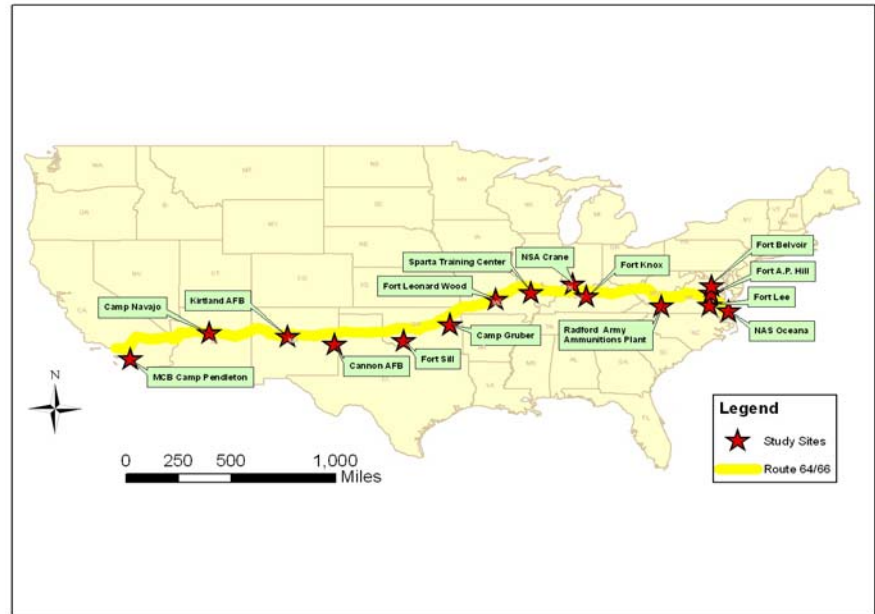


Figure 2. Percentage of Bd positive samples by installation. Bases are arranged from west to east, in the order they appear in Figure 1. Left side y-axis indicates both mean annual temperature (° C, red line) and mean annual precipitation (cm, blue line). Note the low percentage of positive samples from the arid western installations, although the relationship between annual precipitation levels and Bd infection rates was not statistically significant.

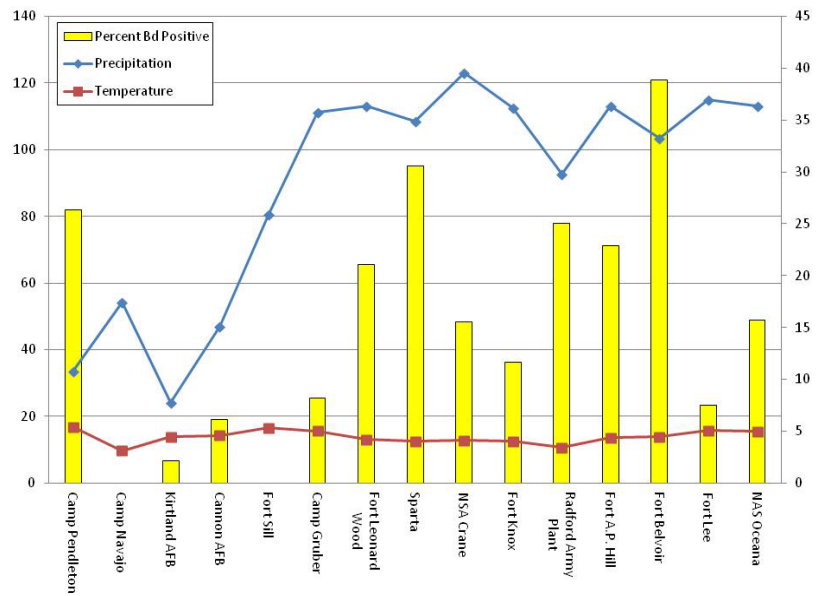


Figure 3. Temporal pattern (seasonality) of Bd infection rates across all installations. Note the strong tendency for the highest infection rates to occur during the spring/early summer sampling period, followed by a precipitous drop off during the mid- to late-summer and fall.

