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**ARE OUTBREAKS OF EMERGING PATHOGENS CORRELATED
WITH CONSTRUCTION OF WETLANDS?**

**REPORT NO. 2: AMPHIBIAN BREEDING AND DISEASE
OUTBREAKS DURING 2014 AND 2015 AND POSSIBLE
CORRELATES WITH ENVIRONMENTAL VARIABLES**

Problem

Emerging infectious diseases are one of the most important factors contributing to global amphibian declines. Reports of mortality due to outbreaks of *Ranavirus* are becoming increasingly common in the U.S. with the reported number of die-offs 3-4 times greater than for the better-known Chytrid fungus. Unfortunately, information on the timing, extent, and frequency of occurrence of outbreaks of *Ranavirus* remain limited, partially due to lack of surveillance and partially due to the rapid onset and mortality caused by the disease.

Objective

The objectives of this project were to (a) examine whether the prevalence of *Ranavirus* is associated with wetlands built as part of highway construction projects, (b) examine whether such rates are higher than for natural wetlands, (c) conduct an assessment of how these rates differ among several states, and (d) examine the relationship between a variety of habitat variables and the prevalence of *Ranavirus*.

Description

The intent of this project was to assess the prevalence and effects of *Ranavirus* on amphibians breeding at constructed and restored SHA wetlands sites (including SWM ponds). These data were compared with data collected during a multi-state survey of *Ranavirus* in naturally-occurring wetlands to determine whether constructed wetlands have a different prevalence of disease outbreaks resulting from *Ranavirus*, and, if so, what environmental variables (e.g., age, size, depth, hydro-period, distance to nearest stream, etc.) of constructed wetlands are correlated with disease outbreaks. Figure 1 (below) shows what tadpoles infected with *Ranavirus* look like in the field.

Figure 1: Photo showing wood frog tadpoles infected with *Ranavirus*



Results

Towson University examined 60 SHA wetlands as candidates for studying *Ranavirus*, ultimately selecting 16 sites in 2014 and 22 in 2015 for focal monitoring. Six sites (37.5%) had some level of die offs in 2014 compared with eight sites (36.3%) in 2015. These rates were slightly higher than those seen in a study of non-SHA wetlands in Maryland. Due to quality control issues, Polymerase Chain Reaction (PCR) testing was only considered reliable in 2015. PCR testing in 2015 found the presence of *Ranavirus* in all die-off sites sampled and 54% of SHA wetlands sampled. This value is comparable to the percentage of sites with positive tests for *Ranavirus* in Delaware (57.1%) and New Jersey (48.4%), but much higher than estimates from non-SHA sites in Maryland (28.6%), Virginia (4.2%), and Pennsylvania (3.3%). Differences among years in the composition of amphibian communities may affect these results. Levels of *Ranavirus* in die-off sites were extremely high, on the order of hundreds of millions of copies of the virus. These data suggest a possible link between environmental variables (especially distance to the nearest stream) and the presence of *Ranavirus* infection, but a larger sample size of ponds would provide a more robust test of this association.

Report Information	Link to Final Report:
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