Meeting the Standards with Vanishing Frogs

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The purpose of this article is to explain how to introduce high school students to the issue of declining amphibian populations by reading the book, *Tracking the Vanishing Frogs: An Ecological Mystery* (Phillips 1994) and playing a game based on concepts introduced in this book. In this article we present a teaching/learning activity in which high school biology and environmental science students practice both reading comprehension and graphing skills, important skills stressed by recent educational reform efforts (NRC 1996). The *National Science Education Standards* suggest actively engaging students in inquiries that interest them and relate to current science topics (NRC 1996). The issue of global decline of frog populations has proven both interesting and important to our students. Engaging in the activities suggested in this article presents an opportunity to enhance students’ understanding of possible outcomes of human disturbances in the natural environment, the interdependence of organisms, and the nature of scientific inquiry.

**Background**

Since the late 1980s, catastrophic frog, toad and salamander declines have been of great concern to scientists. In *Tracking the Vanishing Frogs*, Phillips (1994) recounts the decline of various frog species from around the world. The Golden Toad has disappeared completely from the mountains of Monteverde, Costa Rica, its only known habitat. The gastric brooding frog in Australia has not been seen since 1981. Yellow-legged frogs and red-legged frogs are in trouble in California. Numbers of Yosemite toads, Cascade frogs, leopard frogs and western toads, once abundant in the Cascade Mountains, dropped precipitously in the 1980s and have not recovered. *Tracking the Vanishing Frogs* is an excellent text to use to introduce high school students to the issue of declining amphibians.

In *Nature* (2000) scientists report that we do indeed have reason to ask why frogs are in trouble. As humans, do we need to know what is causing the decline of amphibians? Can the problems responsible for declining amphibians affect humans? Are frogs ecological canaries or biological indicators for our environment? If so, what do we need to learn from the decline and what do we need to do to arrest it?

According to the Houlahan et al. (2000) analysis of 936 amphibian populations from around the world, at a global scale amphibians have declined over the past several decades and continue to do so. Moreover, they suggest that the most dramatic declines for amphibians occurred from 1960 to 1966, decades before herpetologists sounded the ecological alarm.

Ideas abound to account for the frog declines, including changes in local climate, acid precipitation, disease, parasites, environmental contamination, habitat loss and degradation due to direct human impacts, and increased UV irradiation (Houlahan et al. 2000; Pounds et al. 1997). Fungal infections are another possible cause of some declining frog populations.

A fungus that suffocates the animals by coating their undersides and legs has destroyed communities of frogs in Australia and Central America. It is possible that the fungus is spread by herpetologists (Kabbany 1999).

Agricultural chemicals may also be causing some of the declines. When scientists at Trent University in Ontario, Canada, exposed frog eggs and tadpoles to a common pesticide, they found that the frogs experienced high death rates and unusual growth and development patterns (Kabbany 1999).

Undoubtedly, there are other possible causes of local frog declines. As an example of habitat degradation due to direct human impact, the introduction of exotic species into wetland habitats has become prevalent. The introduction of exotic species reduces resources available to native amphibians. Nonnative trout have been released into mountain lakes in California where the yellow-legged frog population has declined. The nonnative trout have made a meal of the slowly developing yellow-legged frogs (Adams 1999).

Clearly, recent studies (Houlahan et al. 2000) provide evidence to support global amphibian population declines. Of the 936 populations of amphibians studied, 61 populations became extinct. Pounds and his colleagues (1997) who have studied amphibian populations in Costa Rica reported that they gathered data for five years expecting amphibian populations to rebound quickly. Unfortunately, amphibian populations have not rebounded; the amphibian fauna remains impoverished. The next section of this article discusses instructional strategies that teachers can use to make students aware of the issue of declining amphibians and the search for causes and implications of amphibian decline.

**Instructional Strategies**

One instructional strategy that we used in our classrooms was a Paideia-like seminar based on *Tracking the Vanishing Frogs*. This approach requires