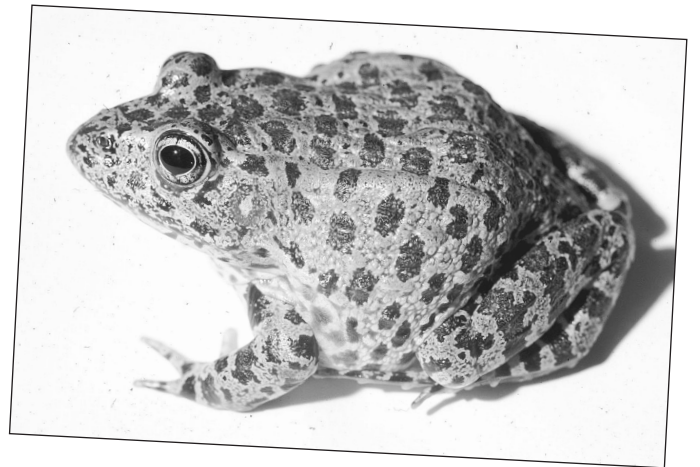




Amphibians at a Crossroads: Overview



From left, the Red Hills salamander (*Phaleognathus hubrichti*), marbled salamander (*Ambystoma opacum*), and the dusky gopher frog (*Rana servosa*).

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They are not protected by fur, feathers, or scales—only a thin skin, permeable to air and water. Yet they are the world's oldest land-dwelling vertebrates, surviving for 350 million years through meteor impacts, ice ages, volcanic eruptions, mountain building, the rise and fall of the dinosaurs, and the appearance of other species.

Because amphibians are such long-term survivors of climatic, geologic, and biological changes, their present condition is alarming. Amphibian populations worldwide are declining, some species are disappearing—even from our most protected parks and refuges—and malformations are appearing in unprecedented numbers.

Many biologists and land managers regard the amphibian situation as "an ecological emergency in progress." Some fear the problem might signal ecosystem disruption that could affect other organisms that share amphibian habitats, including humans.

Modern amphibians—frogs, salamanders, and caecilians—are highly evolved to survive under diverse environmental conditions.

Yet there are numerous credible reports of declines and disappearances of amphibian populations from many regions and habitat types. The most severe losses have occurred in western North America, Central America, and Australia.

Though there is no smoking gun that has been demonstrated as the single cause of these worrisome global declines, the effects of acid precipitation, environmental contaminants, invasive species, disease agents, parasites, and ultraviolet radiation have been suggested, and in some cases, implicated, as being factors, singly or combined, in amphibian losses.

Habitat loss may be the most important factor in declining amphibian populations in North America. Drainage and alteration of wetlands have occurred over vast areas of the continent. Timber harvests in the Southeast and Pacific Northwest altered stream and upland habitats, with subsequent decreases in amphibian populations.

Pollution of streams and standing waters resulting from acid precipitation in the East and acid mine drainage nationwide is a significant threat to aquatic salamanders. The cumulative effects of all these factors, however, are complex and difficult to sort out. A determined and focused national research effort is necessary to identify the specific causes of declines.

In the United States, amphibian declines of unknown origin first occurred in Puerto Rico and in the western states in the late 1970s and early



At top, the pickerel frog (*Rana palustris*), American toad (*Bufo americanus*), flatwoods salamander (*Ambystoma cingulatum*), and the green treefrog (*Hyla cinerea*).

1980s. The populations of many of these species tended to be naturally small and isolated. In the 1990s, malformed amphibians in high numbers were observed in the upper Midwest and around the Great Lakes region into northern New England.

Though the discovery of malformed amphibians may not be directly related to the decline and disappearance of so many of the species, it generated a great deal of publicity and concern about the status of amphibians. Though all regions of the United States are not affected by declines to the same degree, the scope of the declines and malformations suggests that vigilance is needed throughout the nation to ensure the conservation of our 265 native species of amphibians.

In response to these alarming indications of national declines in amphibian populations, the President and the Congress directed Interior to begin a national program of amphibian monitoring, research, and conservation. The U.S. Geological Survey, the science and research bureau of Interior, was given lead responsibility for planning and organizing the program, in cooperation with the National Park Service, Fish and Wildlife Service, Bureau of Land Management, and other cooperators.

In February 2000, a National Framework was drafted and Regional Initiatives began in the USGS, allowing collaboration among all Survey disciplines: biological resources, water resources, and national mapping. A centralized research database is being developed at the USGS Patuxent Wildlife Research Center, and disease and malformation research is being coordinated by the USGS National Wildlife Health Center.

Research biologists in the USGS bring a wealth of field experience to the Amphibian Monitoring and Research Initiative. Amphibian research has a long history in what is now the USGS, beginning in 1972 when one of us, Bruce Bury, was hired as the first full-time herpetologist at the National Fish and Wildlife Research Laboratory in Washington, D.C., which was then part of the U.S. Fish and Wildlife Service.

In 1980, USGS researchers Bury, Ken Dodd, and Gary Fellers produced one of the earliest assessments of the national status of U.S. amphibians. Presently, more than 20 professional herpetologists are nationally involved with USGS amphibian projects, though they also work on a wide variety of other animal groups and research projects.

We now have an infrastructure and personnel for research and conservation efforts on amphibians at a national scale. This is an unparalleled opportunity to better protect these natural resources, especially in concert with cooperators and the public.

To effectively conserve amphibians, USGS researchers work to better identify threats to amphibians and to offer science-based solutions, using a landscape perspective that