

Seashore Amphibians: Indicators of Environmental Quality

by Robert P. Cook, Wildlife Biologist

While miles of ocean beach may be the most popular image of Cape Cod National Seashore it is not the only one. Most of the seashore is neither ocean nor beach, but rather tens of thousands of acres of woodland, field, heath, and dunes. Punctuating these uplands are a variety of freshwater wetlands - kettle ponds, vernal ponds, swamps, marshes, and cranberry bogs - so numerous they are yet to be fully identified and mapped. Tied to these wetlands are the amphibians - a group that makes up in abundance what it lacks in prominence.

Amphibians represent a transition from an aquatic to a terrestrial lifestyle. Their scaleless skin and gelatinous eggs have little resistance to drying, thus requiring moist, if not wet, habitats. They hide under protective cover or burrow to avoid heat and drying. Many are nocturnal or seasonal awaiting spring rains to become active. Because of limited activity, most people only encounter a few of the species found at Cape Cod National Seashore. This lack of familiarity has led to much myth and misunderstanding about amphibians, and a false impression of their abundance, diversity, and ecological importance.

Cape Cod National Seashore supports twelve species of amphibians exhibiting three basic lifestyles. The bullfrog, green frog, red-spotted newt and, to a lesser extent, the pickerel frog are aquatic. They lay their eggs in permanent ponds, where their tadpoles take from one to three years to develop into the adult form. Bullfrogs and green frogs are easily the most conspicuous of the Seashore's amphibians, frequently seen and heard during the summer at kettle ponds and other permanent wetlands. At the other extreme is the completely terrestrial red-backed salamander. The eggs of this worm-sized woodland salamander are laid in decaying logs and undergo complete development without requiring any wetland habitat. The most common amphibian lifestyle here, however, is semi-aquatic. The spotted salamander, four-toed salamander, spadefoot toad, Fowler's toad, spring peeper, grey treefrog, and wood frog all live and feed in forest and dunes for most of the year. With the heavy rains of spring they migrate overland to breeding ponds, usually temporary ponds filled by spring rains. They lay their eggs in these vernal ponds, and then return to the woods. In the vernal ponds, the eggs and larvae develop and transform into the adult form in early to mid-summer, before the pond dries up.

Though once considered primitive and insignificant, studies in the past few decades have demonstrated that amphibians lead far more complicated and important lives. They exhibit territoriality, are capable of homing, and undertake annual migrations. Moreover, some estimates of their numbers suggest there are more pounds per acre of amphibians than any other vertebrate group, making them extremely important in the flow of energy through ecosystems. Amphibians consume large quantities of invertebrates and are consumed in turn by reptiles, birds, and mammals.

Just as awareness of amphibian significance is increasing, reports of amphibian declines throughout the world have begun to cast doubts on their future. Amphibians face a great variety of human threats. Loss of upland habitats to logging and development, wetland draining and filling, pesticides, air and water pollution, road mortality, diseases, and introduced competitors and predators have all been implicated in amphibian population declines. Because they are sensitive to these many forms of environmental degradation, amphibians are good indicators of environmental quality.

Though upland habitats are relatively intact, and wetlands still abundant in the seashore, there are existing and potential problems. Rain on Cape Cod is of the acid variety with a pH of roughly 4.5, close to the lower limit tolerated by many amphibian eggs. Groundwater withdrawal lowers water tables increasing the likelihood that vernal ponds will dry out. Amphibians using them may experience reproductive failure more frequently. On rainy nights when many amphibians migrate to and from breeding ponds or are actively feeding, thousands are killed by traffic on our roads. These factors in their cumulative effects could bring about amphibian declines.

Stewardship of natural and cultural resources is the primary mission at Cape Cod National Seashore. To accomplish this requires resource monitoring. In the case of amphibians, monitoring is needed to determine if populations are increasing or decreasing and why. While conceptually simple, monitoring amphibians is a challenge. Many populations experience dramatic natural fluctuations due mostly to variation in rainfall. Separating human impacts from natural fluctuations takes time, and requires a monitoring program that integrates information on amphibian populations, pond water quality, and hydrology. In cooperation with the U.S. Geological Survey and the University of Rhode Island, such a program is currently under development here, testing a variety of different techniques. These include: Anuran Call Counts - listening at night for calling frogs; Frogloggers - automated tape recorders to do the listening; Vernal Pond Egg Mass Surveys - counting frog and salamander egg masses in vernal ponds; Coverboards - counting animals that hide under pieces of wood; and Mark-Recapture Estimates - estimating a population's size by capturing animals, marking and releasing them, and then resampling to see how many marked animals are again captured.

Through testing these different methods we can determine which will be most useful and effective in allowing us to track the health of our amphibian populations and better understand the issues affecting them. Armed with this information, Cape Cod National Seashore hopes to ensure the high environmental quality necessary to support an abundance of these important but often overlooked animals.

Common Amphibians found in Cape Cod National Seashore



Eastern Spadefoot Toad
(*Scaphiopus holbrookii*)



Bullfrog
(*Rana catesbeiana*)



Wood Frog
(*Rana sylvatica*)



Fowler's Toad
(*Bufo woodhousii fowleri*)



Pickerel Frog
(*Rana palustris*)



Green Frog
(*Rana clamitans*)



Spring Peeper - metamorph
(*Pseudacris crucifer*)



Spring Peeper
(*Pseudacris crucifer*)



Spotted Salamander eggs
(*Maculatum* eggs)



Spotted Salamander
(*Ambystoma maculatum*)



Four-toed Salamander
(*Hemidactylium scutatum*)



Red-backed Salamander
(*Plethodon cinereus*)