

New England's Cottontail



© ANNE BROWN PHOTO

*Relict, opportunistic or soon-to-be endangered species,
the New England cottontail has managed to keep a low profile.
But it is in danger of disappearing from the
woodlands of New Hampshire.*

BY JOHN A. LITVAITIS

At one time or another, most of us have encountered a small brown bunny while out for a walk or while doing chores in the backyard. If you're a hunter, your experiences also may have included walking through a brushy field hoping to kick up a rabbit or two for the stewpot.

Hunters and naturalists in New Hampshire know that rabbits (cottontails) and snowshoe hares both occur in the state. In summer, they're often difficult to tell apart because they both have a brown coat and usually don't stand still long enough for us to get a good look. In winter, however, the coat of a snowshoe hare turns white and that of a cottontail remains brown. But you may be surprised to know that we actually have two species of cottontails in the

John Litvaitis is a professor of wildlife at the University of New Hampshire and has authored many papers on wildlife ecology in professional publications.

state: Eastern and New England. And it is the New England cottontail that has our concern. Before I summarize the reasons for that concern, let me give you a little background information.

In general appearance, New England cottontails are like other North American rabbits. Smaller than Eastern cottontails, New England cottontails weigh just about 2 pounds. Brown and a conspicuous white tail describe most rabbits. However, if you look closely, you can find a few characteristics that can help you distinguish a New England from an Eastern cottontail. About half of Eastern cottontails have a small white spot on their forehead. This is never found on a New England cottontail. The ears of a New England cottontail are shorter than those of an Eastern and there is a thin black line of fur along the outer edge. If you look closer, you'll also notice a black spot right between the ears of a New England cottontail. These are the only differences you can see.

If you're a hunter, you know that Eastern cottontails will often take you and your dog on a good run. But if you've ever encountered a New England cottontail, you know that they quickly dart into an underground den or a rock wall as soon as they sense danger. Perhaps the most important difference between the two rabbits is where you'll find them. Eastern cottontails are found anywhere there is a grassy opening and some nearby cover. A suburban lawn (food) and hedge (cover) can be suitable habitat for an Eastern cottontail. But you'll never find a New England cottontail in these areas; they require very dense cover and rarely venture far from it.

Among the three species of rabbits and hares found in New Hampshire and most of New England, a great deal is known about Eastern cottontails and snowshoe hares. However, only limited research has been directed toward understanding the ecology of New England cottontails. This rather nondescript rabbit managed to evade taxonomists for nearly a century. It wasn't until 1895 that Outram Bangs first described New England cottontails as a subspecies of Eastern cottontails. Fourteen years later, E. W. Nelson recognized that this rabbit was indeed a distinct species.

What really surprised biologists was a report in 1992 that indicated the New England cottontail was actually two species! Based on regional differences in chromosome numbers, populations west of the Hudson River in New York are now considered "Appalachian cottontails," whereas those to the east retain the name "New England cottontail." Most of us are only mildly surprised to hear that a new species of bird or insect has been encountered in the rain forests of South America. After all, taxonomists have only recently entered those forests. But to discover a new species of mammal in one of the most densely populated regions of North America was quite unexpected.

Threatened with Extinction

The revision in taxonomy may have some unexpected consequences. Wildlife biologists have known that the abundance of New England cottontails has declined sharply since the early 1960s. In spite of this decline, no serious action was taken, apparently because populations in the southern Appalachians seemed quite secure. However, these populations in the South are now known to be Appalachian cottontails. As a result, the New England cottontail may have the dubious distinction of becoming the newest threatened or endangered species in the United States because its range has declined by more than 75 percent.

What could have caused such a rapid decline for a species like the New England cottontail? After all, the reproductive capabilities of rabbits

are well known. During the late 1960s and early 1970s, Bob McDowell and a group of his students at the University of Connecticut searched for an answer to this question. McDowell and his students suggested that the early-successional habitats preferred by New England cottontails were being lost to development and forest maturation.

Additionally, New England cottontails were apparently being displaced by expanding populations of the larger (and assumed dominant) Eastern cottontail. During the 1920s through the 1950s, state wildlife agencies and private hunting clubs introduced thousands of Eastern cottontails into southern New England. Most of these rabbits were from populations in Kansas, Missouri and Texas. Prior to these releases, Eastern cottontails ranged only as far north as southwestern Connecticut. These introductions probably triggered the expansion of Eastern cottontails to areas as far north as the Canada-Vermont border. The notion that expanding populations of Eastern cottontails was affecting New England cottontails was quite appealing because the expansion of Eastern cottontails roughly coincided with the decline of New England cottontails. But evidence was lacking.

Since 1990, I have been working with a group of graduate students at the University of New Hampshire to determine if this explanation or others could help resolve why an animal like a cottontail could be threatened with extinction. I suspected that habitat change was a more likely explanation for the decline in New England cottontails than competition because there are regions of New England (especially central New Hampshire and southern Maine) where Eastern cottontails do not occur and populations of New England cottontails have still declined.

To appreciate the role of habitat change on New England cottontails, a short review of the history of land use in New England is helpful. In New Hampshire, for example, relatively continuous forests covered approximately 90 percent of the state at the time of settlement by Europeans. Like most colonized regions,

You have to look carefully to distinguish an Eastern cottontail (top) from a New England cottontail (bottom). About half of the Easterns have a small white spot on their forehead; New England don't have this. The eyes of the Easterns are also bigger than New England. And the ears of a New England are shorter, with a thin black line along the outer edge. A New England also has a black spot between the ears.



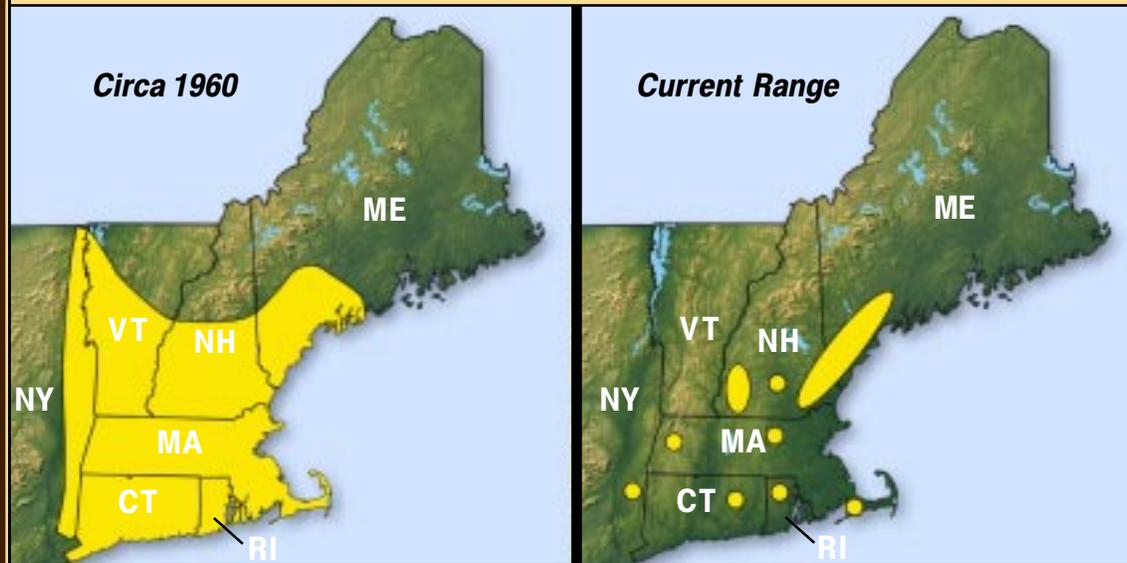
© ALAN BRIERE PHOTO



continued on next page

From 1900 through 1960, there was an accumulation of young forests throughout New England, filled with the thicket habitat preferred by the New England cottontail. After the early 1960s, these young forests began to mature. The New England cottontail is now found in only a few scattered places in its namesake range.

RANGE OF THE NEW ENGLAND COTTONTAIL



During the 1920s through the 1950s, state wildlife agencies and private hunting clubs introduced thousands of Eastern cottontails into southern New England.

forests were cleared for agriculture, and by 1880 remnant forests covered less than 40 percent of the state. But agriculture did not persist. Farmers could not produce large enough crops from the thin, rocky soils to compete with midwestern agriculture. Most of this land was left idle and reverted to second-growth forests.

Using this information and a simple model of forest growth, I estimated that there was an accumulation of young forests throughout New England from approximately 1900 to 1960. Such forests were ideal for New England cottontails and other animals that rely on “thicket habitats.” However, by the early 1960s, these lands matured into closed-canopy forests that were no longer suitable for rabbits and their populations rapidly declined. This pattern of land clearing and forest growth also explains the rise and fall of other mammals and birds that are dependent on young forest habitats, including bobcats, ruffed grouse and woodcock.

Battle of the Bunnies

Our ability to understand the rapid decline in populations of New England cottontails was explained by the loss of young forests. But one issue was still puzzling. How could Eastern cottontails expand their range while populations of New England cottontails declined? Previously, biologists speculated that the larger Eastern cottontail (about 3 pounds) physically dominated the smaller New England cottontail (about 2 pounds). This physical dominance suggests that as populations of Eastern cottontails expanded throughout southern and central New England, they simply replaced endemic populations of New England cottontails.

To investigate this scenario, my students and I constructed a large enclosure where we placed both species. Rabbits adjusted quickly to the enclosure. The only detectable difference between them was that Eastern cottontails were often observed in areas with little understory cover. We then placed one of each species into a smaller enclosure to make more detailed observations. To our surprise, Eastern cottontails did not have an obvious ability to overpower New England cottontails. When rabbits were involved in “disagreements,” New England cottontails won about half of the bouts when there was a clear winner. Physical domination, therefore, did not explain why Eastern cottontails were more successful.

Our next experiment was a bit more elaborate. We constructed a second enclosure where we were able to separate rabbits in individual sections of the enclosure. Next, we built special feeders that would enable us to remotely monitor rabbit activity. Each feeder was equipped with an electronic sensor that recorded when a rabbit was present. A series of experiments was conducted to understand how both species used an environment where they had to choose between food and cover. In one series, it was clear that Eastern cottontails would venture away from cover to get enough to eat. Our farthest feeder was about 60 feet from cover, a long distance for a rabbit trying to avoid a hungry fox or owl. New England cottontails were very reluctant to visit these feeders unless they started to lose weight and were clearly very hungry.

We extended the experiment for about two months and had some very interesting results. Although we had constructed the enclosure to

keep predators out (6-foot chain-link fence with nylon lines strung over the top), a couple of owls managed to periodically catch a rabbit. Over the course of the extended trial, twice as many New England cottontails were taken by the owls in comparison to Eastern cottontails. For some reason, New England cottontails seemed to be more vulnerable to predators. Perhaps this could explain the differences in their respective responses to land use change.

In an earlier field study, we found that populations of red foxes and coyotes in southern New Hampshire increased as land-use patterns shifted from forest dominated to a mix of forest, farmland and suburban developments. Such diverse landscapes describe much of New England. Both of these predators are quite adaptable and they seem to benefit from the additional food sources associated with farmlands (more rodents) and developments (trash). Red foxes and coyotes also were the most common cause of death of the 75 radio-tagged New England cottontails we monitored throughout southern New Hampshire. But why would one rabbit be more vulnerable to predators? After all, they look almost identical – or do they?

Watch Out for That Owl

Our final experiment was an effort to understand if Eastern cottontails could indeed detect an approaching predator sooner and at greater distances than New England cottontails. If they could, then this would explain their ability to occupy a variety of habitat including those with limited cover. To investigate this, we took a low-tech approach. We constructed an owl using a plastic model and added some plywood wings that we painted black. Next, we built a wire glide that enabled us to hang the owl model on a pulley and sail it along the wire. To examine the response of each rabbit, we placed individuals in some wire cages and positioned a nearby video camera to focus on the rabbit. Next, we marked the wire with distances from the rabbit's cage and attached a microphone to the video camera that let one of us speak onto the tape while tracking the owl and recording the rabbit's reaction.



© ALAN BRIERE PHOTO

The Eastern cottontail, with its big eyes, can better detect a predator (such as an owl) than a New England cottontail.



Here again, we were quite surprised by the results. Eastern cottontails detected the approaching owl when it was about 70 feet away. Clearly this detection distance would often let the rabbit escape to cover. New England cottontails, on the other hand, did not respond until the owl was only 30 feet away. These results indicate that New England cottontails may be more vulnerable to predators when they are in open habitats.

But what adaptations do Eastern cottontails have that are apparently lacking in New England cottontails? Quite simply, big eyes. We found that the eyes of Eastern cottontails are about 50 percent bigger than those of New England cottontails. As a result, they are probably taking in a much larger area and thus able to spot a predator sooner (and further) than a New England cottontail. This difference is probably a consequence of the original habitat that each rabbit occupied. Eastern cottontails likely evolved in large open habitats of the Midwest. New England cottontails are essentially a woodland species, probably most abundant in native shrublands (especially mountain laurel and scrub oak) or young forests created by fires, hurricanes and beaver flowages. A woodland species would not have an opportunity to detect a predator at long distances, and so did not evolve

A New England cottontail is placed in a wire cage (above) as part of an experiment designed to determine if the Eastern cottontails can detect an approaching predator at greater distances than the New England cottontails.

continued on next page

Although managing thicket habitats doesn't generate the public enthusiasm as some other programs have, it's important to remember that a variety of habitats are needed by wildlife.

The New England's habitat is a thicket, a messy tangle where it has cover and food. In New Hampshire, this type of habitat has been reduced to small patches (usually a few acres, more or less).



PAUL FUSCO PHOTO © CONN. DEP

bigger eyes. Because staying close to cover is probably the best strategy in forest habitats, New England cottontails suffer disproportionately when cover shrinks. Recent landscape modifications, especially suburbanization, continue to reduce the availability of habitats required by New England cottontails. Roads and developments also have fragmented and isolated what habitat patches are present. Such habitats are still adequate for Eastern cottontails.

Finding New England Cottontails

Will the New England cottontail survive? Unlike many other rare or endangered species, the habitat of New England cottontails is relatively easy to maintain. Perhaps it isn't too late to take steps to ensure that this species doesn't vanish from our forests. The first step of any restoration plan is to have a good understanding of what you have.

Last year, I began collaborating with state and federal wildlife biologists to get a more complete picture of New England cottontails in New Hampshire and the rest of New England and Eastern New York. For two years we will inventory the entire region to identify places that still support cottontails and vacant habitats that could support them if they were transplanted there. Of course we won't be able to visit every patch, but we will search sites throughout the state.

Additionally, we are using a new approach to find rabbits. Rather than setting box traps baited with apples, a method that is effective but takes a great deal of effort, we will search patches for rabbit pellets. For several years, I have been working with molecular biologists to develop a technique that would enable us to identify rabbits from their fecal pellets. As digested food passes through a rabbit's intestines, a few cells from the intestine are scraped away and are embedded in their pellets. Our technique recovers the DNA in

the pellets and allows us to determine what species provided the sample. Field trials last winter were very encouraging: From 141 samples collected mostly in New Hampshire, we were able to identify the source of 132 samples. This technique should enable us to cover a large area and

provide a complete picture on the status of New England cottontails.

We have completed most of our survey of New Hampshire, and our results indicate that the New England cottontail isn't faring very well in the state. Populations occur in Strafford County, including the towns of Barrington, Dover, Durham, Lee and Rollinsford. Here, cottontails occur among a variety of habitats, especially former agricultural lands that have been idle for 10 years or more. These sites are dominated by thick shrubs and young trees.

Unfortunately, many of these sites are "just waiting" to be developed. A standing joke I have with graduate students that are trying to capture cottontails for their individual projects is to set box traps wherever they find a "Land for Sale" sign. Many of the areas where we studied cottontails in the mid 1990s are now developed into suburban neighborhoods and it seems likely that more of the habitats currently occupied by cottontails will be developed.

Threatened Thickets

The other region where we have found New England cottontails is the Merrimack River corridor, including the towns of Bow, Hooksett, Derry, Windham and Londonderry. Additionally, cottontails are still hanging on in Manchester, Litchfield, Bedford, Merrimack and Hudson. Development activity in this region is probably the most intense in the state and we were surprised to find rabbits here. Most occupied patches of habitat are small, usually a few acres or less. Industrial parks seem to be especially popular among cottontails. But as development of these areas continues, cottontails will be squeezed out.

Based on historic observations by biologists affiliated with New Hampshire Fish and Game, we anticipated encountering New England cottontails in the Connecticut River Valley, especially in the area of Keene, Westmoreland and Walpole. But we only found Eastern cottontails in this region this past winter and are left to conclude that New England cottontails may have been extirpated from the Connecticut River Valley.

Once the range-wide inventory is complete, biologists can use the information to develop a comprehensive management plan. Efforts to aid New England cottontails also will benefit other thicket species. Although managing thicket habitats doesn't generate the public enthusiasm as some other programs have, it's important to remember that a variety of habitats are needed by wildlife. Shrublands and early-successional forests are important breeding, feeding and cover habitats for a large number of species. So let's make sure these habitats are available for our own New England cottontail. 