

Science & Ecology

Acorn Booms & Busts

Variability in annual acorn production has an important effect on forest ecosystems

By Edna Greig

2011 was a bust year for acorns. The oak trees in our area produced few nuts. In contrast, 2010 was a boom year, and a thick layer of acorns covered both forest floors and suburban yards. Year-to-year variation in acorn production is common, but why did such an extreme variation occur in 2010 and 2011? How does this affect forest ecosystems?

First, a little background on oaks. The four most common oak species in our area are split into two groups. The red oak group, which includes red (*Quercus rubra*) and black (*Q. velutina*) oaks, has leaves with pointed and bristled lobes. The white oak group, which includes white (*Q. alba*) and chestnut (*Q. prinus*) oaks, has leaves with rounded lobes. The red oak group takes two years to mature its acorns, while the white oak group takes one year. Acorns mature in late summer and early fall and are an important food for mammals, birds, and insects.

At irregular intervals of about three to five years, individuals of an oak species over a wide geographical area produce a bumper, or mast, crop of acorns. One hypothesis is that the trees evolved masting as a strategy to improve reproductive success. In most years, animals consume 80 to 100% of the acorn crop, leaving few acorns to germinate into new tree seedlings. In a mast year, trees produce so many acorns that animals cannot possibly eat them all. Another hypothesis is that masting is a

response to favorable environmental conditions, especially to weather conditions during April, when trees are flowering and being pollinated.

The trees exhaust themselves by producing so many acorns in a mast year and typically produce few acorns over the following one to three years. Each species of oak follows its own annual pattern of acorn production—an acorn boom year for black oak might coincide with an acorn bust year for white oak. If each species is at a low point in its acorn production cycle in a given year, there will be virtually no acorn crop, as happened in 2011.

What can happen to a forest ecosystem following an acorn bust year? Larger animals like deer and bears often can find alternative food sources and may not be severely affected. But mice and chipmunks rely upon acorns for their winter caches and will likely suffer dramatic population declines. The following spring and summer, populations of insects and other invertebrates may increase because there are far fewer mice and chipmunks eating them. Mice and chipmunks also eat the eggs of ground-nesting birds like juncos, so these birds might increase in number. The raptors, snakes, and mammals that prey primarily upon rodents may face food shortages and population declines.

Mice also harbor the bacterium that causes Lyme disease, which they can transmit to black-legged ticks that obtain their first blood meal from them. Fewer mice following an acorn bust year means fewer ticks being infected with the bacterium. These ticks get their second blood meal the summer thereafter, often from a larger mammal or human. If the ticks were not infected with the bacterium the previous year, they cannot transmit Lyme disease. Studies by Dr. Richard Ostfeld and others at the Cary Institute of Ecosystem Studies in Millbrook, NY, have shown that the size of an acorn crop is a valuable predictor of

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the risk for Lyme disease in humans two years later.

Acorn booms and busts affect forest ecosystems in complex ways that scientists are continuing to investigate. Given the acorn boom crop of 2010, we should be extra vigilant about Lyme disease in 2012.

Trail Conference member Edna Greig writes regularly for Trail Walker on natural history topics. Find previous articles by her and other science/natural history contributors on our website: nynjtc.org/news/science

