



PERIODICAL CICADAS IN GEORGIA

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TAKE HOME POINTS

- Seventeen-year cicadas are native to eastern North America and are characterized in groups called “broods” that emerge on different 17-year cycles. There are also different cicada species that emerge in 13-year intervals and other species that can be seen on an annual basis.
- There was an emergence of Brood X cicadas in Georgia in the summer of 2021.
- Branch dieback (flagging) occurs on trees and shrubs where eggs were laid. While extensive flagging may occur on some trees and can be shocking, the damage is largely superficial.
- Periodical cicadas are not major pests in forests and established landscapes.
- We can expect to see the next generation of Brood X cicadas in Georgia in 2038. In addition, smaller emergences of a different brood of 17-year cicadas will occur in 2034, and an emergence of Brood XIX of 13-year cicadas will occur in 2024.



Figure 1: An annual cicada in Blue Ridge, Fannin County, Georgia. July 16, 2021 .
Photo credit: Ashley Hoppers, UGA Extension

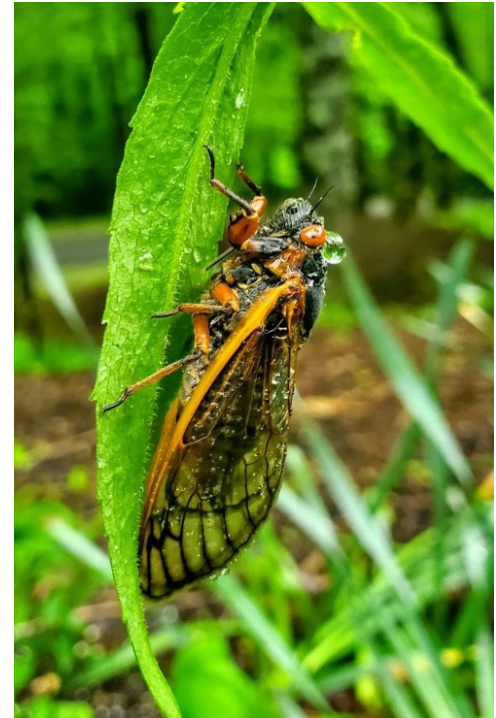


Figure 2: A periodical cicada in Ellijay, Gilmer County, Georgia. May 4, 2021.
Photo credit: Ashley Hoppers, UGA Extension

INTRODUCTION

Cicadas are classified in the order Hemiptera (true bugs) and are members of the family Cicadidae, which consists of approximately 3,400 species of cicadas. These species are further classified into one of two major types: annual (Figure 1) or periodical (Figure 2). Between the two, there are far more annual cicada species, as they have a large geographical range and have been identified on every continent, except Antarctica. Comparatively, periodical cicadas make up a much smaller portion of the species of Cicadidae. They are only native to certain regions of eastern North America and are found nowhere else in the world.

Despite both cicada types inhabiting the United States, most people will find the annual cicada or “dog day cicada” (*Neotibicen* spp.) the most familiar. As the name implies, annual cicadas have a generational cycle spanning over one year, with the height of their emergence occurring during the hottest days of summer. While annual cicadas emerge each year and are commonly seen in the summer months, periodical cicadas (*Magicicada* spp.) are more of a rarity. Their rarity is in part due to their restricted geographical ranges in eastern North America. However, another contributing factor is the amount of time required for these insects to complete their life cycle.

The periodical cicada has the longest development time of the described insect species in North America. Periodical cicadas complete their life cycle in precisely timed, mass emergence events every 13 or 17 years, depending on the species. Specific populations of periodical cicadas that share the same emergence years are called “broods”. Each brood is classified with its own Roman numeral. Each brood is composed of either three species of 17-year periodical cicadas (*Magicicada septendecim*, *M. cassini*, and *M. septendecula*) or four species of 13-year periodical cicadas (*M. tredecim*, *M. neotredecim*, *M. tredecassini*, and *M. tredecula*).¹ The majority of the 17-year

cicadas occupy a more northern geographic range. The 17-year periodical cicadas generally emerge to the north, east, and west of the more southern, centrally located 13-year periodical cicadas. Thirteen-year periodical cicada broods emerge across the southern states and throughout the Mississippi Valley.² Of these species, Georgia is within geographic range of one 13-year periodical cicada brood and three broods of 17-year periodical cicadas (Figure 3).³

While historical data indicates there were once 30 recognized broods scattered across the eastern U.S.,⁴ these broods have dwindled to 12 active broods of 17-year periodical cicadas and three 13-year periodical cicada broods.³ Typically, individual broods are comprised of mixed-species groups of the same life cycle type. For example, three species of 17-year periodical cicadas form the mixed-species group of Brood X, the largest of the 12 broods of 17-year periodical cicadas. Previously seen in 2004, Brood X, also known as the Great Eastern Brood, emerged once again in the spring and summer of 2021. Brood X

occupied a geographic range spanning over 15 states, stretching from Michigan all the down to North Georgia.

As with many species, both annual and periodical cicada life cycles are linked with specific environmental cues that guide their life history events. Phenology is distinct events that occur during the life cycle of a plant or animal in relation to seasonal climatic change. Environmental variation, such as deviation from the average temperature and precipitation for a certain time of year, can have a strong impact on a given species' phenology. Just as the exact timing for peak fall color is difficult to pinpoint on the calendar, a similar element of uncertainty affects the exact timing of a given brood's emergence. Thus, rather than relying on an exact date to predict when a brood will emerge, specific environmental conditions known to impact the life cycle are considered. Emergence of past broods have been related to soil temperature and moisture conditions. Once the 8-inch soil temperature reaches a sustained temperature of at least 64 °F (17.8 °C), and the soil is adequately moist, optimal emergence conditions have been met and the brood will respond and begin to emerge in synchrony. Periodical cicadas usually begin emerging in late spring in the southern states because the soil temperature reaches optimal temperatures in the southernmost regions first. The rest of the brood usually emerges in the northern states in the weeks to follow. Local weather conditions in spring have a strong influence on when a geographic area may start seeing cicadas emerge. In 2021, initial emergence of Brood X in Georgia was observed in early May when soil temperatures reached 64 °F (17.8 °C).

LIFE CYCLE

Though there are several different species of periodical cicadas, they have similar life cycles. Immature cicadas hatch from eggs laid on tree branches and then fall to the ground. Young cicadas are white and ant-like in appearance.⁵ These juveniles burrow 6 to 18 inches underground and feed on sap from plant roots.⁶ They will spend the next thirteen or seventeen years underground feeding and developing until they have nearly reached maturity.⁵ Mature juveniles sometimes create "cicada huts" when emerging from moist soils, which are tubes made from mud that rise three to five inches above the ground. Cicadas use these structures to emerge from

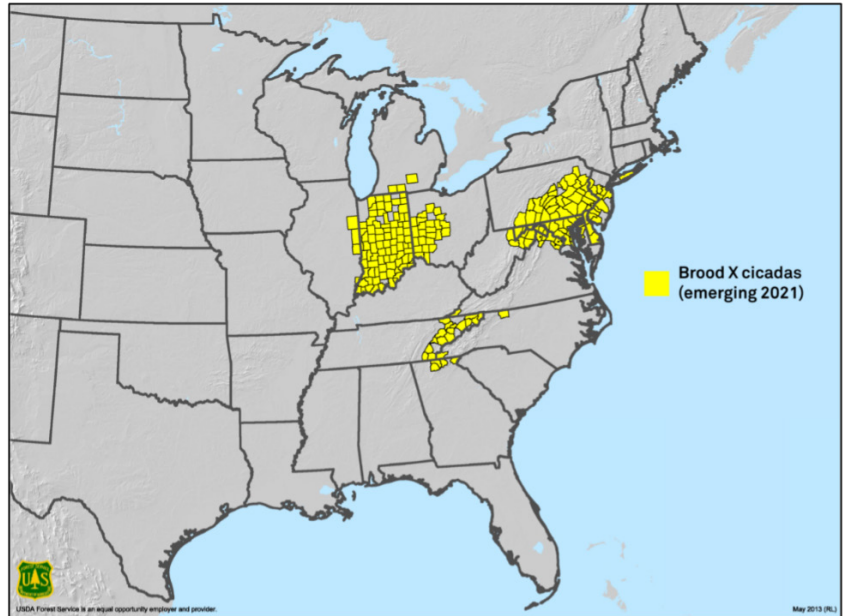


Figure 3: Periodical cicada Brood X map.
 Map credit: USDA Forest Service

the soil.⁷ After emerging through the cicada hut, they climb onto nearby vegetation or other vertical surfaces at night. They then shed their outer skin in a process called molting, becoming fully mature adults (Figure 4).⁵ These cicada emergences are synchronized, meaning that many individuals go through this process at the same time. Up to a million individuals per acre can emerge within seven to ten days of one another.⁸ Five to eighteen days after emergence, adult males begin making their characteristic loud mating calls using organs called tymbals to attract female cicadas.⁸ These mating calls can exceed 90 decibels, making them about as loud as a lawnmower.⁹ Once a female has located a suitable partner, the pair mates. The female receives a copulatory plug from the male that acts as a physical barrier that prevents her from mating again.⁸ Males often mate with multiple females.⁷ After mating, females create ¼ to ½ inch diameter slits in the bark of small twigs and oviposit (lay eggs) in these crevices.⁶ Eggs will hatch in about six to ten weeks, beginning the cycle anew.^{3,8}

One of the most obvious signs of periodical cicada emergence is the physical damage to branches called “flagging” caused by the egg-laying process (Figure 5). This damage can disrupt water conduction in twigs, which can kill leaves at the tips of branches.⁶ These cuts often injure the branch enough to where it will break. Flagging becomes apparent as the leaves die and change color (Figure 6). Some of these damaged small branches break and fall to the ground while others remain on the tree. Flagging is usually harmless in forested settings or in all but recently planted landscape trees, and most established trees will easily recover.¹⁰



Figure 4: *A recently emerged periodical cicada molting in Ellijay, Gilmer County, Georgia. May 13, 2021.*
Photo credit: Ashley Hoppers, UGA Extension

Once the eggs hatch, the tiny white nymphs drop to the ground and tunnel into the soil to feed on tree roots for the next 13 or 17 years. Developing immature cicadas may damage small roots as they feed on root sap, though this does very little to harm the tree’s overall health.

After the last emergence of Brood X in 2004, researchers monitored the growth of trees in a forest on which periodical cicadas laid eggs and found no effect of cicada oviposition on tree growth.¹⁰ However, newly planted ornamental and fruit trees can be seriously damaged in commercial nurseries, orchards, and landscapes.⁷ In northern Georgia, cicadas appear to have a strong preference for oaks. However, they have been recorded laying eggs on many different host trees (Table 1).

Despite the minor damage they cause to plants, periodical cicada years are quite beneficial to the ecology of the region. Their emergence tunnels in the ground acts as a natural aeration of the soil. The large number of adult cicadas provides a food bonanza to all sorts of predators, which can have a positive impact on their populations. After the cicadas die their decaying bodies contribute a massive amount of nitrogen and other nutrients to the soil.

Table 1. Recorded Periodical Cicada Host Plants¹

Boxelder <i>Acer negundo</i>	American beech <i>Fagus grandifolia</i>	Callery pear <i>Pyrus calleryana</i>
red maple <i>Acer rubrum</i>	white ash <i>Fraxinus americana</i>	white oak <i>Quercus alba</i>
sugar maple <i>Acer saccharum</i>	green ash <i>Fraxinus pennsylvanica</i>	swamp white oak <i>Quercus bicolor</i>
gray alder <i>Alnus incana</i>	shrubby St. John's-wort <i>Hypericum prolificum</i>	shingle oak <i>Quercus imbricaria</i>
common pawpaw <i>Asimina triloba</i>	black walnut <i>Juglans nigra</i>	bur oak <i>Quercus macrocarpa</i>
river birch <i>Betula nigra</i>	eastern red cedar <i>Juniperus virginiana</i>	swamp chestnut oak <i>Quercus michauxii</i>
American hornbeam <i>Carpinus caroliniana</i>	spicebush <i>Lindera benzoin</i>	pin oak <i>Quercus palustris</i>
hickory <i>Carya</i> spp.	sweetgum <i>Liquidambar styraciflua</i>	northern red oak <i>Quercus rubra</i>
hackberry <i>Celtis occidentalis</i>	yellow poplar <i>Liriodendron tulipifera</i>	winged sumac <i>Rhus copallinum</i>
buttonbush <i>Cephalanthus occidentalis</i>	black gum <i>Nyssa sylvatica</i>	black locust <i>Robinia pseudoacacia</i>
eastern redbud <i>Cercis canadensis</i>	American hop hornbeam <i>Ostrya virginiana</i>	black willow <i>Salix nigra</i>
flowering dogwood <i>Cornus florida</i>	American sycamore <i>Platanus occidentalis</i>	sassafras <i>Sassafras albidum</i>
hawthorn <i>Crataegus</i> spp.	eastern cottonwood <i>Populus deltoides</i>	slippery elm <i>Ulmus rubra</i>
common persimmon <i>Diospyros virginiana</i>	black cherry <i>Prunus serotina</i>	deerberry <i>Vaccinium stamineum</i>

¹Table developed from Clay et al. (2009) and Williamson (2004).

PUBLIC CONCERNS

Humans may experience a periodical cicada emergence a few times in their lifetime, and it can be quite the spectacle to behold. Since colonial times, periodical cicadas have been referred to as “locusts”. An infamous pest of biblical proportions, migratory locusts are no longer found in North or South America. They are a type of grasshopper capable of forming massive swarms that travel long distances in search for food. Due to their voracious appetite, migratory locusts are a force of nature that can cause significant agricultural loss and hardship.

Unlike migratory locusts, periodical cicadas are not a significant threat to agriculture, as they are slow, clumsy fliers that generally travel no more than a few hundred feet at a time. While migratory locusts have chewing mouthparts, periodical cicadas have piercing-sucking mouthparts used to remove sap from plants. A mass emergence of periodical cicadas may resemble a swarm of locusts due to sheer numbers, adult periodical cicadas do not fly in swarms, although they do aggregate in trees as the males call to attract the females. Lastly, cicadas are not a threat to humans or pets, as they can neither sting nor bite and are not known to carry disease. The extent of any egg laying damage to established landscape or forest trees is superficial in nature. Conversely, egg laying damage may weaken newly planted saplings in nurseries, orchards, and landscapes that lack an abundance of healthy branches. Tree fruits of bearing age may also undergo some level of terminal shoot damage and crop loss due to the added weight of fruit on weakened shoot tips.

The best way to avoid damage to specimen trees in the home landscape would be to plan ahead and delay installing new trees until after the periodical cicada adults have emerged, done their damage, and died. Tree fruit orchard managers may also wish to delay installing new blocks of trees on years periodical cicadas are emerging. If susceptible trees are already in the ground and are of a manageable size, then their branch tips may be protected by covering them using a fine netting or other breathable fabric. Damage results from female cicadas laying eggs on small twigs and branches, not from feeding, so insecticides are not recommended for control.



Figure 5: *Cicada oviposition damage on European pear in Blue Ridge, GA. August 5, 2021.*
Photo credit: Ashley Hoppers, UGA Extension

There is no need to despair for those who may be concerned whether these insects pose a risk to their personal health and safety. While male cicadas make noise when handled, they cannot bite or sting, so they pose no risk to humans and animals. Additionally, they are not poisonous. However, pets that consume an excessive amount of them may experience stomach discomfort, as one would expect from overindulging in any type of food. Having said that, these insects are a huge benefit to local wildlife. Some of the beneficiaries include mammals, birds, reptiles, amphibians, and even other insects. A myth commonly perpetrated when periodical cicadas emerge is that their presence will lead to more copperhead snakes and a higher likelihood of encountering them. Copperheads will certainly eat periodical cicadas. However, copperheads cannot predict periodical cicada emergence the year prior and breed in higher numbers in anticipation of there being cicadas the following year. Furthermore, like other wildlife, copperheads are opportunistic feeders and will consume whatever food source happens to be available.

By coming out en masse, periodical cicadas serve as a primary food source for multiple types of animals while still perpetuating their species. This reproductive pattern is called predator satiation, and enables periodical cicada reproductive success through supplying predators with more prey than they can consume. Much like the mayfly hatch, fish species such as bass, carp, catfish, and trout will also prey on periodical cicadas and take advantage of the smorgasbord. Accordingly, avid fly fishers across the country seek out opportunities to fish during a periodical cicada emergence. Some fishermen even make their own cicada lures and keep track with where the next hatch will be.

SUMMARY

All things considered, periodical cicadas are not major pests in forests and established landscapes. They are unique insects that benefit many different members of our wildlife community. In the early summer, adult cicadas will finish their mating and begin to die off.⁸ However, the eggs they leave behind will hatch, and their offspring will begin developing in preparation for the next emergence, ensuring the continuation of the species. While we wait for the return of Brood X, the offspring of the 2021 generation will be developing belowground, feeding on sap from roots and growing for the next 17 years. During this period, most damaged trees will recover, and their growth will continue unaffected by the cicada damage.¹¹ We can expect to see Brood X again in 2038; however, several other broods will emerge before then. Brood VI, a smaller brood of 17-year periodical cicadas, will emerge in 2034, and Brood XIX of 13-year periodical cicadas, also referred to as “The Great Southern Brood”, will emerge in 2024.³ This brood will be the next group of periodical cicadas to emerge in Georgia. Until then, we can still expect to hear and see annual cicadas each summer.

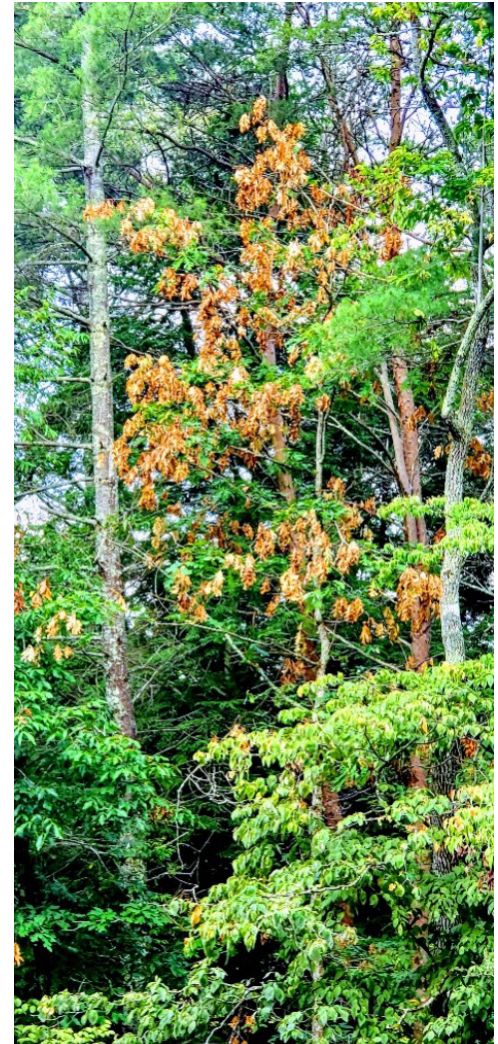


Figure 6: Examples of flagging on oak in Ellijay, GA. June 24, 2021.

Photo credit: Ashley Hoppers, UGA Extension

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