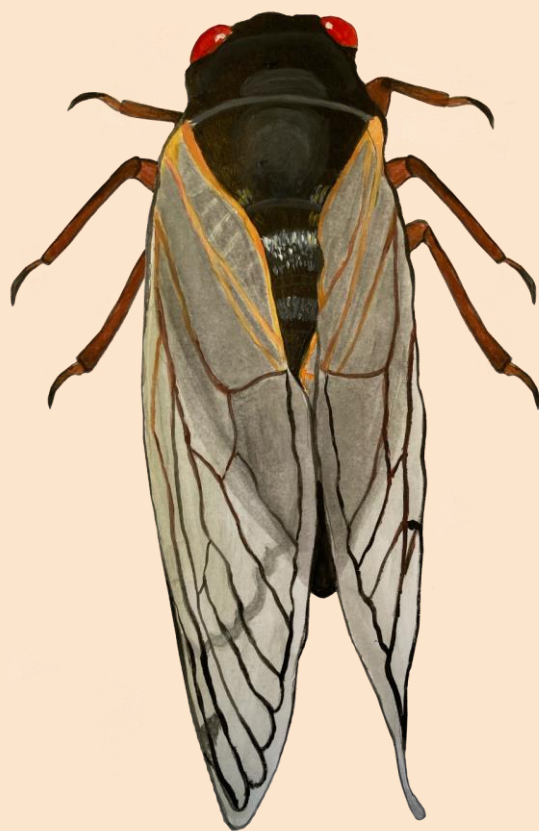


I am a Friend to Cicadas!



Name: _____

Date: _____

About this Notebook



Dear Friends of Cicadas,

We are scientists who conduct research on periodical cicadas. Being an insect scientist, or entomologist, is so much fun because you get to ask questions and then go outside to look for answers. We have more questions than answers about these amazing insects!

We feel very lucky to be able to witness this entomological treat every 13 or 17 years. Many people become scared during the emergences of periodical cicadas because they do not understand the fascinating story of these gentle and harmless insects.

This notebook will help you to become a knowledgeable and curious scientist. As a friend to cicadas, you can help us replace fear with fascination as we explore this amazing wonder of nature.

Sincerely,

Ms. Diane Lill, Director of Education, Conservation Nation

Dr. Martha Weiss, Professor of Biology, Georgetown University

Dr. John Lill, Professor of Biology, George Washington University

Dr. Zoe Getman-Pickering, University of Massachusetts Amherst

Ms. Gabriela Paola Franco Peña, Conservation Nation

Illustrations by Zoe Getman-Pickering

[MEET THE SCIENTISTS IN THIS VIDEO](#)

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Science

Science



What is a Cicada?

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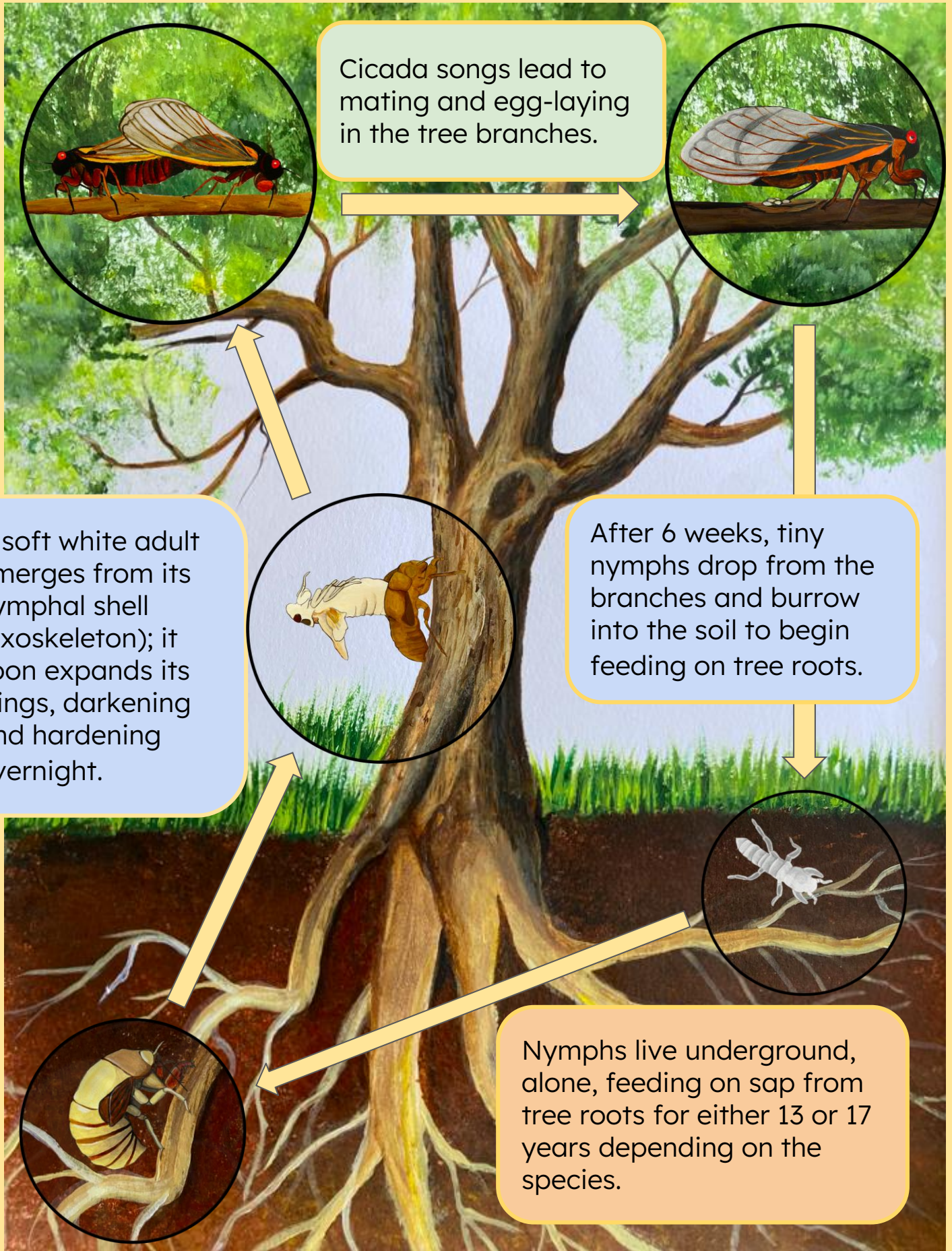
Amazing Cicada Life Cycle | Sir David Attenborough's Life In the Undergrowth | BBC

Click on the links above to watch these short videos about periodical cicadas.

What are some questions you have about cicadas?
Write your questions here:

Life Cycle of Periodical Cicadas

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Exoskeletons

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When a nymph molts, it leaves behind its empty exoskeleton. Sometimes the exoskeletons are attached to the side of a tree or a leaf, and they look like a living insect; however, they will have a crack down the back where the adult came out, and they will not contain a living cicada. If you look closely at an exoskeleton, you can see the outlines of what will become the adult's wings, a long skinny mouthparts, large eyes, and six legs. Can you see that its front legs are bigger than the others, to help the nymph to dig in the soil?

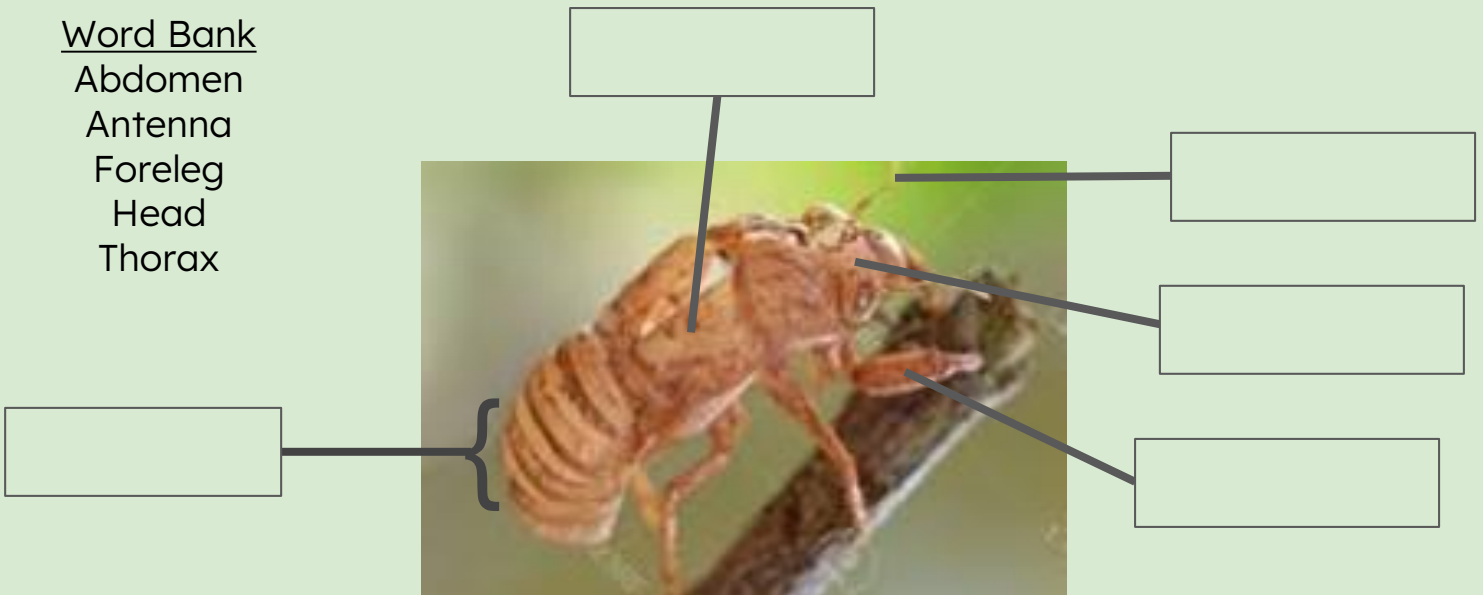


Empty exoskeletons are fun to collect!

Label the parts of the exoskeleton:

Word Bank

- Abdomen
- Antenna
- Foreleg
- Head
- Thorax



Signs of Cicadas

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Photo credit: M. Raupp

Data Challenge:

Estimate the density of periodical cicadas that emerged from beneath this tree.

Density is measured as holes per square foot (inside the white square).

_____holes/ft²

Besides exoskeletons, scientists look for a variety of other clues that indicate cicadas are present in an area, including:

- Emergence holes in the soil dug by the nymphs (above)
- Small clusters of dead leaves in trees (called 'flagging') in the summer after emergence; these indicate where the female cicadas have made their egg nests (bottom right)
- Egg nest scars on the smaller branches of trees and shrubs that healed from the wounds of egg nests (bottom left)



Joe Boggs, OSU Extension©

Cicada Data

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Record your observations about periodical cicadas here. Your observations may include things like cicada holes in the ground, exoskeletons, nymphs, adult cicadas, choruses, flagging, etc.

OBSERVATION	DATE	TIME OF DAY	LOCATION



Optional: Using the [Cicada Safari](#) Smartphone App is a great way to contribute to community science!

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Math

Math



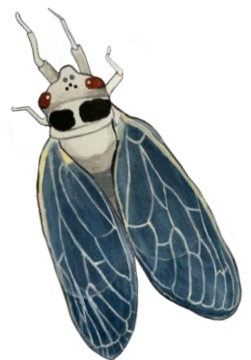
Fill in the Cicada Timeline for Brood XIV



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INSTRUCTIONS: The following timeline shows years of Brood XIV emergences going back 204 years (but fossils show us that these species have been around for millions of years!). Fill in the blanks with the missing years, recalling that Brood XIV cicadas emerge every 17 years, and add a historical fact for 2025:

YEAR	HISTORICAL FACT
2025	Fill in current fact:
	Barack Obama became the first Black American elected President of the U.S.
1991	The very first website, called the World Wide Web Project, was published.
	The Rubik's Cube was invented.
	The Soviet Union launched Sputnik, the first space satellite.
1940	Bugs Bunny was created.
	The famous Hollywood sign was erected.
1906	The Wright Brothers were granted a patent for a "Flying Machine".
	The Eiffel Tower opened in Paris.
1872	Yellowstone National Park was established.
	The transcontinental railroad ran from the Atlantic Ocean to the Pacific Ocean.
	Samuel Morse demonstrated the first telegraph to Congress.
1821	Missouri became the 24th state.

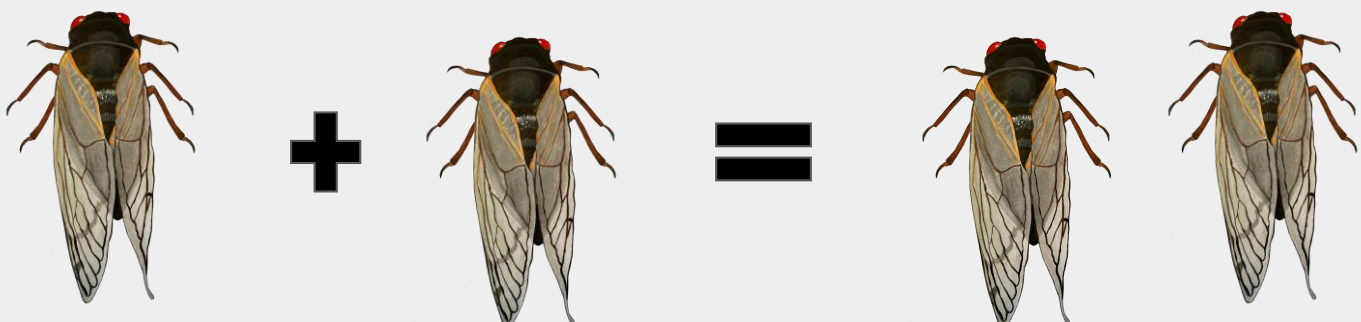


Cicada Calculations



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How old will you be when the brood you are seeing now emerges again?	
How many emergences of this cicada brood will occur over the entire 21st century (2000-2100)?	
In one typical cicada emergence year, scientists noted that about 15% of the adult cicadas were eaten by birds. Estimate how many cicadas are likely to survive bird predation in a county where 10,000,000 cicadas emerge.	
How old were the cicadas that are emerging this year when you were born? (Hint: They hatched either 13 or 17 years ago.)	
If 150 cicadas emerge in 1 square yard, estimate how many cicadas could emerge from a patch the size of a football field (about 100 x 50 yds).	



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History



History



[Benjamin Banneker](#) was a self-taught mathematician, farmer, and astronomer who grew up in Maryland in the 1700's. He is well known for his correspondence with political leaders such as Thomas Jefferson on racial equality and ending slavery. He was also a great observer of nature and he wrote the following reflection on the Brood X periodical cicadas of Maryland in one of his journals.

“The first great Locust year that I can remember was 1749. I was then about Seventeen years of age when thousands of them came and was creeping up the trees and bushes. I then imagined that they came to eat and destroy the fruit of the Earth, and would occasion a famine in the land. I therefore began to kill and destroy them, but soon saw that my labor was in vain, therefore gave over my pretension. Again in the year 1766, which is Seventeen years after the first appearance, they made a Second, and appeared to me to be full as numerous as the first. I then, being about thirty-four years of age, had more sense than to endeavor to destroy them, knowing they were not so pernicious to the fruit of the Earth as I did imagine they would be. Again in the year 1783 which was Seventeen years since their second appearance to me, they made their third; and they may be expected again the year 1800, which is Seventeen years since their third appearance to me.”

SOURCE: <https://core.ac.uk/download/pdf/148359244.pdf>

How did Benjamin Banneker's views about the periodical cicadas change over time?

Read All About It!

Here are some headlines from previous periodical cicada emergence years:

“Cicadas by the Billions Bug Residents of the East”, [LA Times](#)

“Midwest Bracing for Cicada Invasion”, [CBS News](#)

“Cicadas Swarm DC Area”, [GW Hatchet](#)

“Trillions of Cicadas to Plague U.S.”, [BBC News](#)

“Those Emerging Cicadas are Giving Some People Anxiety”, [CNN](#)

Below, list some headlines you can find about this year’s emergence:



Think about how these headlines make you feel about cicadas. Write your own news headline that will make people curious to learn about cicadas instead of being scared:

Cicada Memories



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Interview someone who remembers a past cicada emergence and write a paragraph describing their memories **OR** write a letter to future generations describing your own memories of a cicada emergence. Use the space below for your reflections:

A large, empty rectangular box with a thin black border, intended for the user to write their reflections or interview transcript.

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Music

Music



Cicada Songs

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Listen to the sounds of various cicada species by visiting the Cicadamania.com site or listening to them in your neighborhood.

Describe or draw what the mating call sounds like to you:

Can you imitate the cicada songs? Make up a dance?

Cicada Songs

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Most of the cicadas you hear are males calling as loudly as they can to find a mate. Male cicadas have special structures on their sides called [tymbals](#) that they can move rapidly back and forth to create noise. The inside of their abdomen is mostly hollow, so it amplifies the sound even more. Males call loudly to try to attract females. Cicadas make one of the loudest calls of any insect! Click on the video below to see a tymbal in action:



TRY THIS:

To see how the tymbals work, find an empty plastic water bottle (without a top) and squash it in and out in the middle. It will make a loud noise as the plastic bends back and forth, over an empty chamber -- much like the cicada's rigid tymbal membrane, next to its hollow abdomen. What happens if you fill the bottle with water or sand? Will it still make a loud noise when you squash it? If the cicada's abdomen wasn't mostly hollow, the insect wouldn't be able to make so much noise!

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Writing

Writing



Test your knowledge!

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Cicadas are a type of _____. A cicada has _____ legs and three body parts: a head, a thorax, and an _____. Cicadas are not _____. Cicadas are found in wooded areas throughout the world, but _____ cicadas are only found in the eastern United States. Periodical cicadas spend most of their life _____. They have special _____ that allow them to suck plant sap from tree roots. Because they feed only on plants, they are _____. A group of cicada species that emerge together in a given place is called a _____. There is an _____ of cicadas in the spring every _____ or _____ years. By emerging in such large numbers all at once, periodical cicadas make sure that many will escape the _____ that like to eat them. About a week after emerging, _____ cicadas will produce a _____ buzzing song to attract and impress female cicadas. Many males singing together is called a _____. If a female cicada hears the song of a male that she likes, she will make a _____ noise in response to signal her interest. Once a male and female cicada have mated, the female flies off and lays _____ of eggs in the twigs of _____ to start the next generation. Different species of cicadas have different courtship _____ that are recognized only by females of the same species.



WORD BANK

abdomen	herbivores	male	six
brood	hundreds	mouthparts	songs
chorus clicking	insect	periodical	thirteen
emergence	locusts	predators	trees
		seventeen	underground

Haiku Poems

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Haiku is a Japanese form of poetry. Each poem consists of 3 lines that do not rhyme. The first line has 5 syllables, the second line has 7 syllables, and the third line has 5 syllables. Traditionally, writers of Haiku have focused on expressing an emotional connection to nature. [The Haiku Foundation](#) has a wonderful website with teaching tools for different grade levels that can help you learn more about this art form.



Snug in Silver Spring
Seventeen-year Cicadas
Sing Sarah to sleep

Underneath my feet
Feeding, growing, and waiting
Since I learned to walk

My Haiku Poem:

A large, empty, rounded rectangular box with a light pink background, intended for the user to write their own haiku poem.

See more examples from the winners from our 2021 Brood X Haiku Contest [HERE](#).

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And More!

More

What should I do if I notice an adult or kid is scared of cicadas?

You can help your family and friends understand that cicadas can't hurt them, and they are actually super cool. Share some of the interesting facts you have learned to help others get to know cicadas better. And be patient! Sometimes adults need more help than kids to open their minds and hearts to insects.



Can I keep them as pets?

It's best not to capture cicadas or keep them as pets. They have been waiting for 13 or 17 years to reach this stage of their lives, and they should be allowed to fulfill their mission of reproducing the next generation. Instead of keeping them in a jar, why not find a spot with lots of cicadas outside where you can watch them in nature? You will get a much better understanding of how they act that way. It is okay to collect the shed exoskeletons, though!

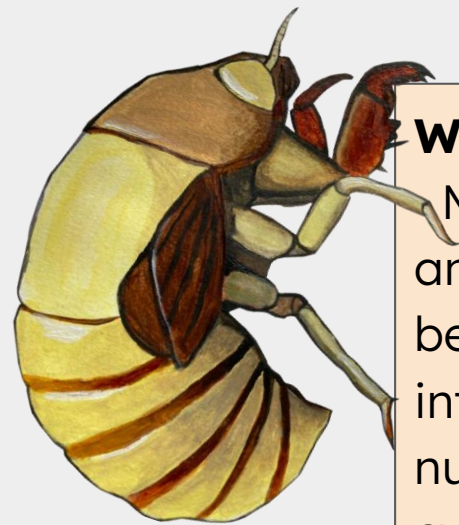
Will the cicadas hurt the trees?

Large trees are not harmed by cicadas, though some leaves will die back. Small trees and shrubs can be damaged from the egg nests made by the female cicadas. Netting can be used to protect small trees.



What happens to all the cicadas after they die?

Many dead cicadas will be eaten by scavenging animals like raccoons, rodents, ants, slugs, and beetles. Those that aren't eaten will decompose into the soil where they will provide a lot of nutrients to support growing plants. And so the cycle of life continues.



How do cicadas tell time?

We don't know! Each spring, there are chemical changes in the sap that flows from the roots up to the leaves; while cicadas can use those changes to detect that another year has passed, we have no idea how they keep track of how much time has passed.



Abdomen - The rear-most body region of an insect.

Antennae - Long feelers on an insect's head that they use to smell and taste things.

Cicada - A type of insect that spends most of its life as a nymph underground feeding on the sap of tree roots.

Chorus - A group of many male cicadas singing together.

Emergence - The process of cicada nymphs coming up from underground to molt into cicada adults.

Exoskeleton - A rigid external covering of an insect's body that provides both support and protection.

Herbivore - An animal that gets its energy from feeding on plants.

Metamorphosis - The process by which an insect changes from a young immature form to a different adult form.

Molting - The process by which juvenile insects grow, requiring them to shed their hardened exoskeleton and grow a larger one.

Nymph - The term for some immature insects that do not have a pupal stage.

Life Cycle - The series of important events that occur in the life of a living organism, including when and where they are born, develop to adulthood, reproduce, and die.

Predator - An animal that get its energy by killing and eating other animals.

Predator satiation - An anti-predator strategy in which prey, like cicadas, briefly occur in very large numbers, reducing the chance that any one individual will be eaten and ensuring that many survive to reproduce.

Prey - An animal that is hunted and eaten by other animals.

Ovipositor - A tube-like body part through which female insects lay eggs.

Thorax - The middle region of an insect's body where the legs and wings attach.

Tymbal - A flexible sound-producing organ found on the abdomen of male cicadas. Males 'sing' by flexing these rigid ribbed membranes back and forth several hundred times per second.

For More Info:

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[Return of the Cicadas \(PBS Documentary\)](#)

[Cicada Mania: Cicada Insect News, Facts, Life Cycle, Photos & Sounds](#)

[The 2024 Periodical Cicada Emergence](#)

Our website: www.FriendtoCicadas.org

Thank you for being a friend to cicadas!



CONSERVATION
NATION 



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