

## Photo Description



This image shows a large cicada insect resting on a plant branch with reddish leaves. The cicada has clear, veined wings, large bulging eyes, and a brownish-yellow body with distinctive markings. You can see the detailed wing patterns and the insect's sturdy legs gripping onto the branch.

## Scientific Phenomena

This image represents the Anchoring Phenomenon of cicada emergence and metamorphosis. Cicadas spend most of their lives underground as nymphs, feeding on tree root fluids for 13 or 17 years depending on the species. When environmental conditions are right (soil temperature reaches about 64°F), millions of cicadas emerge simultaneously, molt into their adult form, and begin their brief above-ground life cycle focused on mating and reproduction. This mass emergence is a survival strategy called "predator satiation" - there are so many cicadas that predators cannot eat them all, ensuring species survival.

## Core Science Concepts

1. Complete Metamorphosis: Cicadas undergo dramatic physical changes from egg to nymph to adult, demonstrating how organisms develop and change over their lifetime.
2. Adaptation and Survival Strategies: The synchronized mass emergence every 13 or 17 years is an evolutionary adaptation that overwhelms predators and ensures reproductive success.
3. Life Cycles and Timing: Cicadas have one of the longest life cycles of any insect, with most of their life spent underground in the nymph stage.
4. Ecosystem Interactions: Adult cicadas serve as food sources for many animals, while nymphs aerate soil and adults contribute nutrients when they die.

### Pedagogical Tip:

Use a KWL chart (Know-Want to Know-Learned) before showing this image to activate prior knowledge about insects and life cycles. Many students may have heard cicadas buzzing in summer but never seen one up close.

### UDL Suggestions:

Provide multiple ways to explore cicada sounds by playing audio recordings at different volumes, using visual sound wave representations, and allowing students to feel vibrations through a speaker to accommodate different sensory preferences and hearing abilities.

### Zoom In / Zoom Out

1. **Zoom In:** At the cellular level, cicadas produce their loud buzzing sounds using specialized structures called tymbals - ribbed membranes that buckle rapidly when muscles contract, creating vibrations that resonate in hollow chambers in their abdomen.
2. **Zoom Out:** Cicada emergences affect entire forest ecosystems, providing massive food sources for birds, mammals, reptiles, and other insects. Their decomposing bodies add significant nitrogen and other nutrients to forest soils, supporting plant growth for years after emergence events.

### Discussion Questions

1. Why might cicadas spend so many years underground before emerging all at once? (Bloom's: Analyze | DOK: 3)
2. How do you think the mass emergence of cicadas affects other animals in the forest? (Bloom's: Evaluate | DOK: 2)
3. What patterns do you notice in the cicada's body structure that help it survive? (Bloom's: Analyze | DOK: 2)
4. If climate change affects soil temperatures, how might this impact cicada emergence timing? (Bloom's: Synthesize | DOK: 4)

### Potential Student Misconceptions

1. **Misconception:** "Cicadas are the same as locusts and will eat all the plants."
- Clarification: Cicadas are not locusts and do not eat plants. Adult cicadas primarily drink tree sap and fluids, causing minimal damage to trees.
2. **Misconception:** "Cicadas come out every summer."
- Clarification: Periodical cicadas emerge in massive numbers only every 13 or 17 years, though some annual cicada species do appear each summer in smaller numbers.
3. **Misconception:** "The loud buzzing sound means cicadas are angry or dangerous."
- Clarification: Male cicadas make buzzing sounds to attract mates for reproduction - it's their way of "singing" to find a partner.

### Cross-Curricular Ideas

1. **Math - Data Collection & Graphing:** Students can collect data on cicada emergence patterns over 13 and 17-year cycles and create bar graphs or line graphs comparing the two periodical cicada species. They can calculate how many times a 13-year cicada emerges in a person's lifetime or determine the total years a cicada spends underground versus above ground.
2. **ELA - Descriptive Writing & Poetry:** Have students write detailed descriptive paragraphs about the cicada using sensory language (what they see, hear, and feel). Students could also create acrostic poems using the word "CICADA" or write fictional journal entries from a cicada's perspective during its 17 years underground and brief time above ground.
3. **Social Studies - Human Impact & Environmental Changes:** Explore how cicada emergence affects human communities—some towns prepare for the noise and disruption, while others celebrate with "cicada festivals." Students can research how climate change and human development might impact cicada habitats and emergence timing, connecting to concepts of environmental stewardship.

4. Art - Detailed Observation Drawing: Students can create large-scale, detailed drawings or paintings of cicadas based on this photograph, focusing on the intricate wing patterns, body segments, and coloration. This combines scientific observation with artistic expression and helps develop fine motor skills and attention to detail.

### STEM Career Connection

1. Entomologist - An entomologist is a scientist who studies insects like cicadas. They observe how insects live, grow, and interact with their environment. Entomologists might spend time in forests counting cicadas, studying their behavior, or learning how they affect plants and animals. Average Annual Salary: \$65,000
2. Ecologist - An ecologist studies how living things interact with each other and their environment. A cicada ecologist might research how the mass emergence of cicadas affects forest ecosystems, what animals eat them, and how their nutrients help plants grow. Average Annual Salary: \$68,000
3. Bioacoustics Researcher - A bioacoustics researcher studies animal sounds and how animals use sound to communicate. Someone in this field might record and analyze cicada buzzing sounds, measure how loud they are, and figure out how male cicadas use sound to find mates. Average Annual Salary: \$62,000

### NGSS Connections

- Performance Expectation: 5-LS2-1 - Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment
- Disciplinary Core Ideas: 5-LS1.B - Growth and Development of Organisms, 5-LS2.A - Interdependent Relationships in Ecosystems
- Crosscutting Concepts: Patterns, Systems and System Models, Structure and Function

### Science Vocabulary

- \* Metamorphosis: The process of transformation from one life stage to another in an organism's development.
- \* Nymph: The juvenile form of certain insects that looks similar to the adult but lacks wings and reproductive organs.
- \* Emergence: When organisms come out from a hidden or protected place, like cicadas coming up from underground.
- \* Predator satiation: A survival strategy where so many individuals appear at once that predators cannot eat them all.
- \* Periodical: Happening at regular, predictable time intervals.
- \* Synchronous: Occurring at the same time in a coordinated way.

### External Resources

Children's Books:

- Cicadas! Strange and Wonderful by Laurence Pringle
- Thirteen-Year Cicadas by Ann O. Squire
- The Life Cycle of a Cicada by Bobbie Kalman