



# TERMITOLOGY (GRADES 3 – 5)

## Lesson Overview

This series of activities will engage students in an inquiry-based study of the ecology of termites. Students will explore the life cycle of termites, the termite's role in the food web, and the unique social structure of termite colonies. The activities may be done in several short sessions spread across several days or in one hour to an hour-and-a-half lesson.

## Correlation with National Science Teachers Association (NSTA) Standards

- History and Nature of Science: Content Standard G: Science as a human endeavor
- Life Science: Content Standard C: The characteristics of organisms
- Science as Inquiry: Content Standard A: Abilities necessary to do scientific inquiry
- Science in Personal and Social Perspectives: Content Standard F: Types of Resources, Changes in Environments, Science and Technology in Local Challenges

### Key Concepts:

- Identification
- Habitat
- Life cycle
- Social structure & cooperative behavior
- Communication
- Decomposition

### Skills Learned:

- Discussion
- Matching
- Cause/Effect
- Communication
- Teamwork
- Cooperative Learning
- Social
- Classification

### Vocabulary Words:

- Insect
- Thorax
- Abdomen
- Antennae
- Cellulose
- Microorganisms
- Nymph
- Soldiers
- Workers
- Reproductives
- Swarmers
- Caste system
- Caste
- Sterile
- Pheromones
- Trophylaxis
- Decomposers



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## Getting Ready:

### **Estimated Time:**

- Preparation: 20 Minutes
- Lesson: 60 - 90 Minutes

### **Materials:**

- 2 - 4 sponges, for demonstrating to the class
- plastic container lid (for displaying damp sponges)
- scale and weights (for measuring damp sponges)
- Termite Anatomy Poster

### **Preparation:**

- Review the short readings and decide whether to print copies for the class to read or wither you'll use them as read alouds.
- Arrange with another classroom to play "Intrude Alert!" (see step 2 below).
- Print a copy of the Termite Fact Sheet for reference, either on a transparency or printout large enough for the class to see.

## Procedure

### 1. Short Reading: Termite Biology (Background Information)

Post Termite Poster and read the following to the class.

A termite is a type of **insect**. Insects have three body parts – head, **thorax**, and **abdomen** – and six legs, all attached to the thorax. Termites also have **antennae** attached to their head that look like they are made up of tiny beads. Termites are about the size of ants, and look a lot like ants, except that ants have skinny “waists” and termites do not. Ants also have bent antennae and termite antennae are straight.

Termites are sometimes considered pests because they eat wood, and some don't care if the wood is in a forest or a house! They use their hard, chewing mouthparts to destroy wood, twigs, roots, leaves, paper, cardboard, and cotton fabric. All of these things contain a substance called **cellulose**, which the termites digest with the help of **microorganisms** living in their digestive track. If these protozoa, bacteria, and fungi were removed, the termite would die of starvation!

Since termites spend most of their lives underground or inside wood, they cannot see or hear. Instead, they detect vibrations through their legs. When a predator disturbs a termite colony, soldier termites rattle their heads against the side of a tunnel to warn the rest of the colony.

### 2. Activity: Intruder Alert!

- 1) At the beginning of a school day, arrange with a neighboring classroom to play *Intruder Alert!* Identify one student or teacher in each class to be a predator, but keep their identity secret from the other classroom.
- 2) Sometime throughout the day, each class should plan to send their predator into the other classroom. Each classroom should not know when the other classroom's predator is coming. While the predator is walking between classrooms, the predator's home class should warn the neighboring classroom that a predator is approaching by stomping their feet in unison for 5-10 seconds.
- 3) While the students will probably hear the noise of the stomping feet, they should also feel the vibration through the floor. Audible sound is produced when an object vibrates at high frequency, transporting energy via a wave, through a medium such as air. Human eardrums are designed to sense these high frequency vibrations and translate them into sound. How are the legs of a termite similar to a human eardrum?

### 3. Short Reading: Termite Distribution and Habitat

Termites are found all over the world and are very abundant in the tropics. Of the 2200 species known to exist, 45 of them are found in the United States. Not all termite species infest buildings. In fact, fewer than 5% of all termite species are known to feed on the wood of buildings.

Termites require a very unique habitat. They live in dark, cool, and moist passages within and/or connected to their favorite food – wood. They have very thin skin and easily dry out if they are exposed to the outside environment, and therefore require a constant source of moisture. Once a termite colony is formed, it is sealed by members of the colony to maintain constant temperature and humidity levels

### 4. Activity: Wetter is Better

- 1) Explore how different environments affect moisture loss using dampened sponges. First, label and weigh several dry sponges. Then saturate the sponges and wring them out so that they are equally damp, but not dripping wet. Weigh and record the weight of each wet sponge.

- 2) Place each wet sponge on a small plate or margarine container lid (anything nonabsorbent will do) in a different environment. Place one in a sunny windowsill, one in a dark closet, and one inside a shoebox in a dark closet.
- 3) Brainstorm other locations to place sponges where factors such as temperature, air movement, and light will be different. After about four hours, retrieve the sponges and weigh them again.
- 4) Determine how much water was in each sponge at the beginning of the experiment by subtracting their dry weight from their wet weight.
- 5) . Now determine how much water is left in each sponge by subtracting their ending weight from these figures. How much water did each sponge lose? Which one(s) lost the least? The most? Why? How is a sponge similar to a termite's body?

## 5. Short Reading: Termite Life Cycle

Most insects are solitary creatures. They may hang out with others of their kind, but they are responsible for their own care. Termites, however, are social creatures. They live in large colonies where each member has a role in ensuring the success of the colony and keeping each other alive. These roles are determined by the needs of the colony and by the termite life cycle.

Termites begin life as eggs, produced by the king and queen of the colony. The eggs hatch to become **nymphs**, which are immature termites. Nymphs may develop into any of three kinds of adult termites – **soldiers**, **workers**, or **reproductives**. Soldiers have extra large, helmet-like heads used to defend the colony. Workers are the most numerous members of the colony and do most of the eating! Reproductives continue the life cycle by supplementing the king and queen's egg production. At certain times of the year, reproductives develop wings, leave the colony in great swarms (during this stage they are actually called '**swarmers**') and those that survive start new colonies. Most swarmers get eaten by birds, bats, ants, spiders, frogs, toads, and lizards! If something happens to the original king and queen of the colony, a new pair will arise out of the reproductives.

## 6. Junkyard Termites

- 1) Study the termite life cycle and have students use miscellaneous classroom and household recycleables to create three-dimensional models of the termite life cycle. Encourage students to be creative and bring in objects from home that would normally be recycled or thrown away.
- 2) Create teams and limit the time given for each team to construct their termite life cycle. At the end of the time period, allow each team to present their models. In addition to demonstrating their understanding of the termite life cycle, discuss each team's creativity in design, materials, and presentation.

## 7. Termite Social Structure

The unique social structure within a termite colony is called a **caste system**. Each group of termites – soldiers, workers, and reproductives – is a separate **caste**. While soldiers use their enlarged, helmet-like heads and jaws to slash, puncture, and crush enemies of the colony, they are still wingless, blind, and soft-bodied. They are unable to feed themselves and rely on worker termites for food. Worker termites are appropriately named, as they do most of the work of maintaining the colony. Workers care for eggs and nymphs, construct tunnels, excavate chambers, repair damaged nest systems, obtain food and feed the young, soldiers, reproductives, and each other, groom and assist nestmates during molting, and aid soldiers in defending the colony. They are **sterile** (cannot reproduce), wingless, and blind. Reproductives produce all the offspring in a colony, but rely on workers for food.

Whether a nymph forms into a soldier, worker, or reproductive is determined by the needs of the colony at any given moment. These needs are communicated to members of the colony through the sharing and distribution of chemicals called **pheromones** among members of the colony. This is called **trophallaxis**.



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Through the practice of constantly grooming one another, colony members exchange nutrients and pheromones, and are actually communicating!

## 8. Sweet Nothings

- 1) Discuss with students the idea of non-verbal languages. What non-verbal language is widely-used among the hearing-impaired? (American Sign Language.) American Sign Language uses the sense of sight for communication, in the absence of sound. What other sense(s) could be used to communicate?.
- 2) Discuss trophallaxis. What human sense is most like the sense being used by termites during trophallaxis? (Taste.)
- 3) In groups, have students create a non-verbal termite language by assigning meaning to different candy types. Challenge each group to write and act out a skit (A Day in the Life of a Termite Colony) using their language by passing candy to one another to communicate. Have other members of the class try to guess what term or action each candy represented in each group.

## 9. Short Reading: Role of Termites in Nature/Food Chain

In nature, termites represent important members of the food chain known as **decomposers**. Decomposers reduce and recycle dead plant and animal matter and return the nutrients from this matter back into the soil. Termites focus primarily on fallen and decaying wood. Without decomposers refreshing the soil, new plants and trees would not take root and grow to provide food for other animals. The food chain would be broken.

### Extension: Pest Quest

- 1) Visit a local natural area and search for fallen wood, decaying stumps, or rotten logs. Carefully tear into the wood in search of decomposers. In addition to termites, many types of invertebrates are decomposers. You may also find fungi and slime molds. How many different creatures can you find?
- 2) Encourage the students to sketch their subject and findings in a nature journal, carefully noting the date, time, and location of the rotten log or stump. After a few weeks or months, visit the spot again to check on the progress made by the decomposers. Again, have students sketch the stump or log, noting the date, time, and location. What has changed? How does it look different? What will eventually happen to the stump or log.



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## Resources, Visual Aids, and Handouts

### Web Sites

**PestWorld for Kids**, from the National Pest Management Association

[www.pestworldforkids.org](http://www.pestworldforkids.org)

**National Pest Management Association, Inc.**

8100 Oak Street

Dunn Loring Virginia 22027

703-573-8330

[www.pestworld.org](http://www.pestworld.org)

**BugInfo**, from Univar USA, Inc [www.BugInfo.com](http://www.BugInfo.com)

### *Insect Kits and Samples*

#### **Insect Lore**

PO Box 1535

Shafter, California 93263-1535

800•LIVE BUG

[www.insectlore.com](http://www.insectlore.com)

#### **Insect-Sale**

Fang-Ying Huang

Po. Box 70 , Chia-yi city

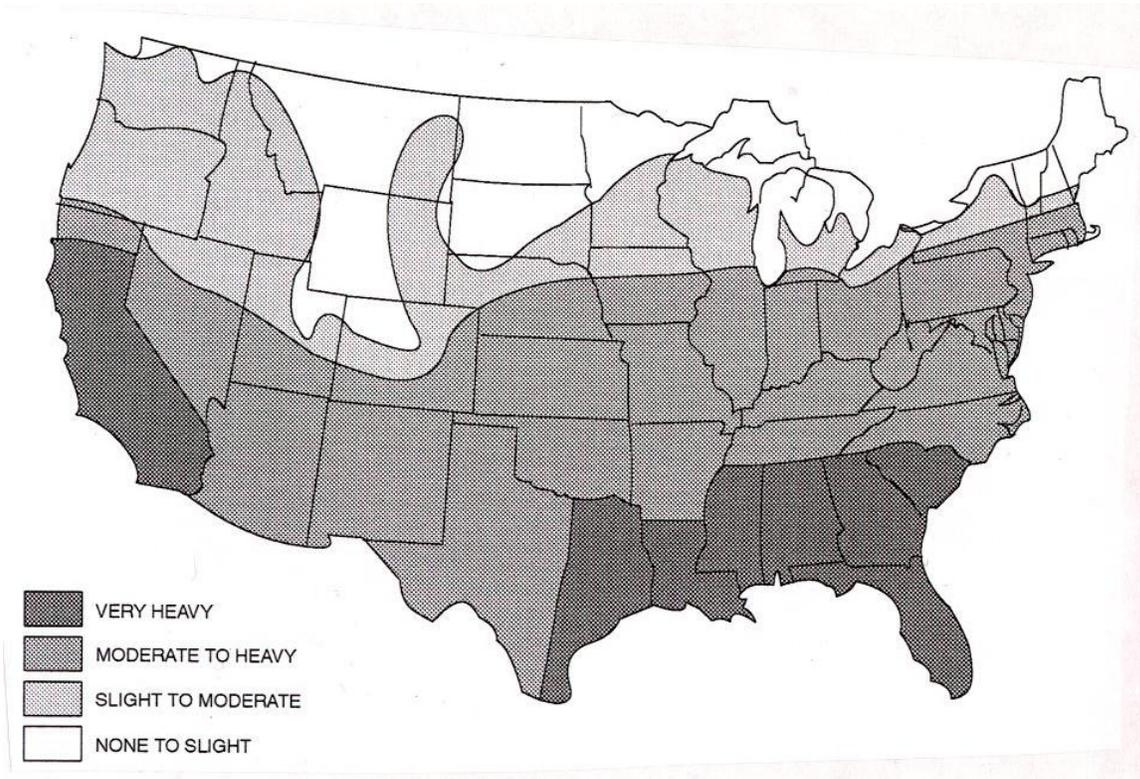
Taiwan 600 R.O.C.

[www.insect-sale.com](http://www.insect-sale.com)

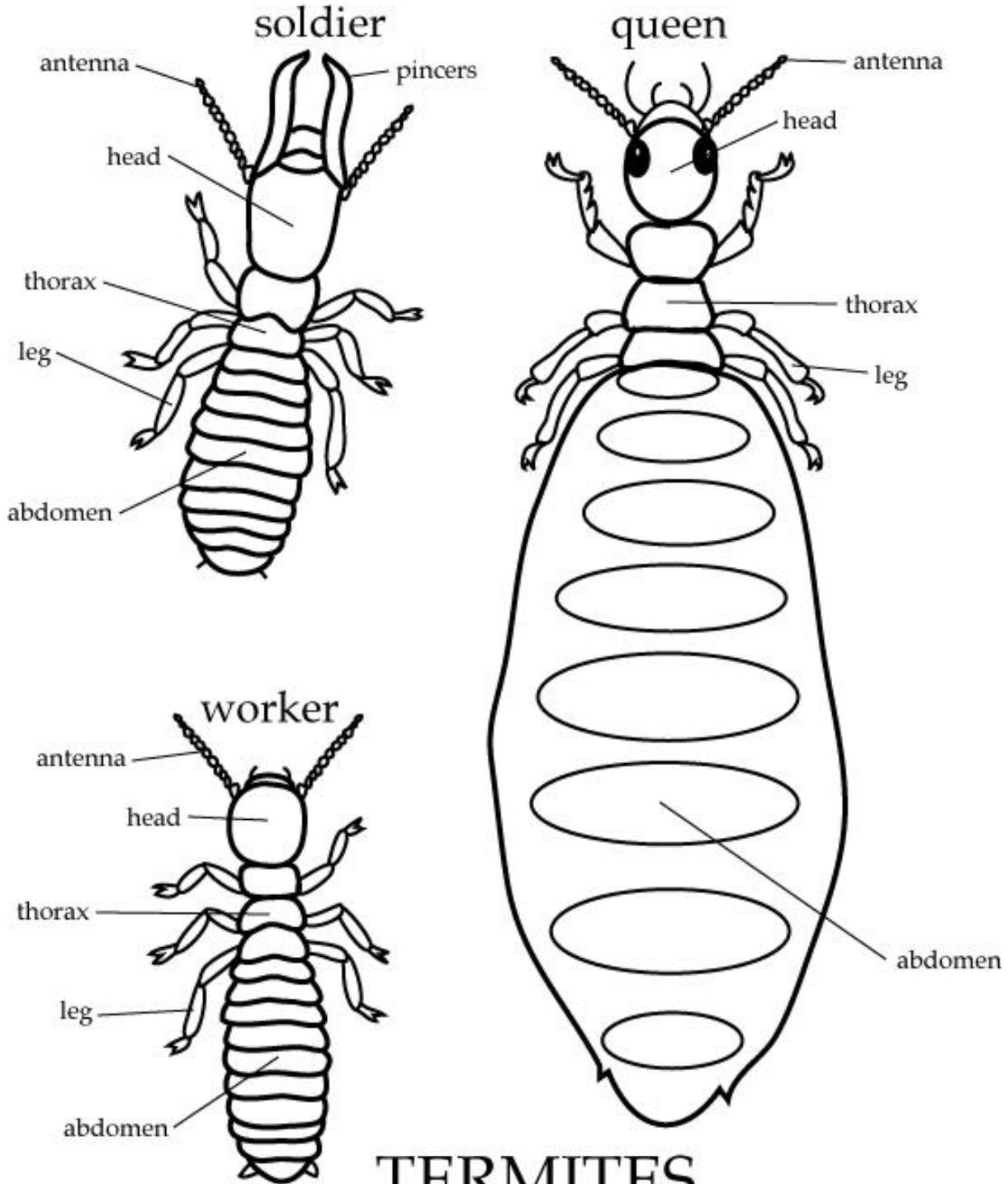
## **Termite Fact Sheet**

1. Termites are insects. They have hard, saw-toothed jaws that help them to eat lumber, wallpaper, plastics, and fabric made of plant fibers.
2. There are four different groups of termites: dampwood, drywood, subterranean and mound builders. Dampwood termites like to live and feed in very moist wood. Drywood termites can survive in very dry conditions and do not need moisture or soil. Subterranean termites are very common and live and breed in soil. Mound builders live in Africa, Australia, Southeast Asia and part of South America; they are able to build large earthen towers 25 feet or higher.
3. Termites can be found in almost every state as well as Mexico and parts of Canada. They favor warmer climates and actively avoid light. (See range map below)
4. As a species, termites date back to the time of the dinosaurs.
5. Termites are 24/7 bugs, which means they eat non-stop – 24 hours a day, seven days a week. They feed on wood and may also destroy paper products such as books, cardboard, boxes and anything containing cellulose. Even buildings with steel framing and masonry walls are targets because of the wooden door and window frames, cabinets and shelving within the buildings.
6. Termites live in underground colonies, some containing over two million members.
7. The social structure of a colony includes the queen, king, winged reproductive swarms, soldiers, and workers. Worker termites are small creamy white insects. They are the most numerous and the cause of all the termite damage.
8. Swarms, or winged reproductives, are termites that leave the colony to mate, reproduce, and start new colonies.
9. In a large nest, a queen and king may live for 15 years, with the queen laying up to one egg every 15 seconds for most of her life.
10. Termites can cause serious damage to structures often long before they are discovered, i.e., more than \$1.5 billion in property damage a year to over 600,000 homes in the United States.
11. How do termites enter the home? The most common termite, the subterranean, builds its nest in the ground. These termites construct mud tubes that are used to explore for food and connect their underground nest to that food source. They can enter a building without direct wood contact with the soil through such tubes. They can find their way into a structure through an opening as small as 1/32 or an inch (smaller than the size of a pinhead!).
12. A pest control professional, or termite control specialist, can provide protection from termite infestation. Professional termite inspectors are trained to locate specific areas in homes where a termite attack is most likely to occur. If termites are found, the specialist can design a treatment plan to control current infestations and to protect homes from future infestations.

## Termite Range Map



**TERMITE ANATOMY POSTER**



**TERMITES**