*Commodity Fact Sheet*

# Bees

***Information compiled by California Foundation for Agriculture in the Classroom***

**How Produced** – Honey bees are raised by beekeepers but also live in the wild. Each colony consists of the queen, male drones, and thousands of female worker bees. Bee colonies have a seasonal cycle that repeats each year. Worker bees and the queen live in colonies and spend the winter eating stored honey. When the weather gets warmer and spring flowers bloom, the bees become more active. In the Spring, thousands of worker bees emerge after metamorphosis from eggs laid by the queen. Worker bees leave the hive to collect pollen and nectar. A bee colony is especially active in the summer as bees forage. In the fall, honey bees reduce or cease their foraging because there are fewer blossoms and flowers. The bees work on storing the pollen and nectar in cells in the hive. Honey bees are the most important pollinating insect because they can be managed and transported to crops requiring pollination. As honey bees gather pollen and nectar for food, they pollinate crops which is essential for food production.

Beekeepers move and manage hives. Well-managed hives may need additional room in the summer, and beekeepers add box-like sections on top of the hive. Each box holds 8-10 wooden frames with sheets of wax foundation where the bees build their hexagonal wax cells for storing pollen and nectar. Pollination services are the primary function and income of most California beekeepers' hives, and beekeeping is a critical part of today's agricultural market.

**History** – Botanist C.A. Shelton introduced honeybees to California in 1853. Transporting the first colonies of bees to America was challenging. The sea voyage from England lasted six to eight weeks, and the bees were confined, which is hard on bee colonies. Many of the first attempts to bring bees were unsuccessful. Bees arrived from the East Coast by ships that traveled through the Panama Canal, then north to the West Coast. Today's honey bees came to the United States from Western Europe in 1622 and to California approximately 200 years later.

**Varieties** – There are about 4,000 species of bees. Wild bee species live in the ground or trees, and honey bees usually live in bee hives. California bees include bumblebees, carpenter bees, digger bees, and most familiar to humans, honey bees. Honey production in California ranked third in the U.S. in 2021 at 9,570,000 pounds with a value of $23 million.

**Commodity Value** – According to USDA, honey bees are responsible for pollinating $15 billion worth of crops. Honey bees pollinate both large commercial crops and backyard gardens. Bees pollinate apples, cherries, peaches, prunes, pears, and many other fruits. They also pollinate crops like cilantro, onions, and alfalfa seed. About one-third of the human diet comes from insect-pollinated plants, and honey bees are responsible for 80% of this pollination.

**Top Producing Counties** – Bees are raised by commercial operations and hobby beekeepers throughout California. Large beekeeping operations, primarily in Northern California counties, produce the majority of queen bees and packaged bees, sold primarily to the Midwest. Major metropolitan areas like the Bay Area, San Diego, and Los Angeles have many hobby beekeepers whose hives play an important role in pollinating urban parks and gardens.

**Nutritional Value** – Honey bees collect nectar and pollen, which they consume for energy. Nectar is also converted to honey and stored in the hive to be consumed later. Honey can provide energy for humans. Honey contains carbohydrates and is prized for its natural sweetness. It is the only sweetener that also contains B vitamins, minerals, and protein.

**For additional information:**
California State Beekeepers Association
(916) 441-0302
Website: californiastatebeekeepers.com

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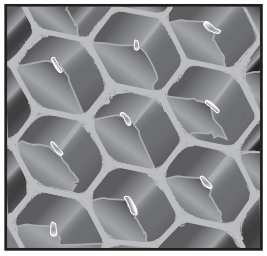
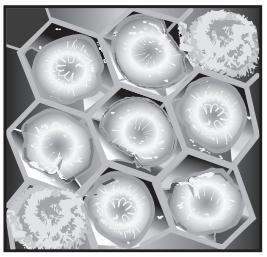
# Bee Activity Sheet



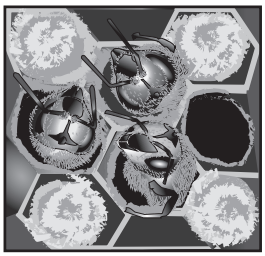
1. The queen bee lays one egg in each cell.



2. After three days, eggs hatch into larvae.

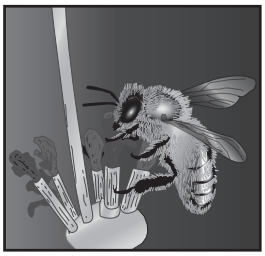
3. After about six days, the eggs are capped and each larva spins itself a cocoon and becomes a pupa.

4. Another ten days later, an adult worker bee emerges.



5. After the new adult comes out, she spends her time with jobs in the hive. This includes cleaning hive cells, feeding the developing larvae, capping the cells with wax, and guarding the front entrance.

6. After about three weeks in the hive, each worker bee leaves her job in the hive to go out and collect food for the colony.



## *Lesson Ideas*

- Research the history of bees and honey, write a report and give an oral presentation.
- Research Colony Collapse Disorder. Create a poster that explains the problem and offers possible solutions.
- Bees build honeycomb made of hexagonal wax cells. Build an art piece using geometric.
- Do a taste test of honey from different regions and bees that pollinated different crops.
- Research the connection between bear population and beekeepers. Report to your class.
- Come up with a recipe using honey and share with your class.
- Study pollinators. Create a pollinator book that includes drawings and facts.

## *Fantastic Facts*

1. A ¼ cup of bees is about 200 bees.
2. Bees have specific jobs. Some collect pollen and others collect nectar.
3. Bees can only sting once and then they die.
4. Bees are insects with three body parts and six legs.
5. People who are allergic to bees may need to have an EpiPen injection used to assist against anaphylactic shock. It does not cure the reaction but provides time allowing the victim to get to the nearest hospital.
6. Most beekeepers in the United States manage European honey bees.
7. Bears do love honey and will raid apiaries.

## *Lesson Plan: Bee Hive Shapes (all about polygons)*

**Introduction:** Each cell in the honeycomb is in the shape of a hexagon. Hexagons are one of the few regular polygons that can fit together perfectly without leaving any gaps. Repeating a shape to cover a surface without any gaps or overlaps is called tessellation. This activity will allow students to explore what shapes create tessellations.

**Objective:** Students will study geometric figures in nature and create tessellation art displays.

**California Standards:** CC Math: 4.G.2, 5.MD.5, 5.G.4, 6.G.2, 7.G.6, 8.G.2, 3, 4, HS.G-CO.5; NGSS: 3-5-ETS1-1; Visual Arts Content: Grades 4-12, 1.0 Artistic Perception

**Materials:** Polygon stencils, notebooks, plain paper, pencils, colored pencils or markers

**Procedure:**

1. Show the class a picture of honeycomb to demonstrate how the hexagonal shapes fit together perfectly. Define the word tessellation and how honeycomb is an example of this.
2. Explain to the class that they will be looking for other geometrical shapes that can tessellate like the hexagon. Students can write a prediction in their notebooks of one or two shapes they think will fit together and why.
3. Give students time to find other polygons that can fit together without gaps or overlaps. Students will use stencils to draw one shape repeatedly to find this out. This can be done independently or in groups.
4. Discuss as a class what the students discovered. Students look back at their predictions and see if they were correct. Older students can discuss which shape is best for beehives and why, including which shape provides the most volume to store honey.
5. Conclude the lesson by allowing students to create and color their own repeating shapes. Display their tessellation art.

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This Fact and Activity Sheet was developed by California Foundation for Agriculture in the Classroom in conjunction with California educators and meets the required education standards of the California Department of Education.