Commodity Fact Sheet

Bees

Information compiled by California Foundation for Agriculture in the Classroom

How Produced – Bees are raised by beekeepers but also exist in the wild. A bee hive has a seasonal cycle that repeats from year to year. During the winter a hive is dormant. The worker bees and the queen spend the winter eating stored honey. When the weather gets warmer and spring flowers start to bloom the colony becomes more active. Worker bees start to leave the hive to collect pollen and nectar. In early summer the colony is very active. Workers leave the hive daily to forage and many new worker bees emerge. By late summer, the colony has grown very large and strong. In the fall, the flowers have stopped blooming and are producing fruit. The colony works on storing food and foraging for nectar slows down.

Honey bees live in colonies that are often maintained, fed, and transported by beekeepers. The modern beehive is made up of a series of square or rectangular boxes, without tops or bottoms, placed one on top of another. Inside the boxes, bees build up the wax honeycomb to raise bees and store honey. Modern hives enable beekeepers to transport bees, moving from field to field as the crops need pollinating and allowing the beekeeper to charge for the pollination services they provide.

History – The honey bees we are familiar with today originally came to the United States from Western Europe around 1622. It wasn't until about 200 years later that they came to California. Bees were finally introduced by using a sea route along the East Coast and crossing Panama, before using the Pacific Ocean for the final part of the journey. It was in 1853 that botanist C. A. Shelton used this route to introduce the first honey bees into California. Transporting colonies of bees either by sea or land in the 1700s and 1800s was not easy. The sea voyage from England lasted six to eight weeks, and it was not easy to keep bees alive for that time while confined. Many of the attempts to transport bees were unsuccessful. But now honey bees are an important part of the American pollination process.

Varieties – There are about 4,000 species of bees. Some species live in the ground, some live in trees, while others live in bee hives. Bees often seen in California are bumblebees, honey bees, carpenter bees, and digger bees. The common honey bee is most familiar to people. This is the bee whose hives are found in hollow trees and in the white wooden boxes managed by beekeepers for honey production and agricultural pollination. Each hive consists of the queen, drones, and thousands of female worker bees. Honey bees are the most important pollinating insect because they can be managed and transported to a pollinator dependent crop.

Commodity Value – A bee colony is worth several hundred dollars. In addition to gathering nectar to produce honey, honey bees perform a vital second function - pollination - making them a critical part of today's agricultural market. This includes products grown in backyard gardens, like apples and squash, but also products like alfalfa seed— creating food for America's meat and dairy industries. In fact, about one-third of the human diet is derived from insect-pollinated plants, and honey bees are responsible for 80 percent of this pollination. California almonds, which is a six-billion dollar industry, depend entirely on honey bees to pollinate their crops. According to a USDA report, in 2013 the annual value of direct honey bee pollination to U.S. agriculture was estimated at over $16 billion. Honey production in California ranked fifth in the country for 2013 at 10,890,000 pounds valued at $22,869,000.

Top Producing Counties – Bees are raised by commercial operations and many small hobby beekeepers throughout California. Shasta County, Merced County, Colusa County, and Sutter County all have large operations that produce queen bees and packaged bees. Queen bee breeder operations tend to be in isolated areas. Major metropolitan areas with hobby beekeepers are in San Diego, Los Angeles, Sonoma, and the Bay Area. Bees are considered livestock!

Nutritional Value – Honey bees collect nectar and store it as honey in their hives. Nectar and honey provide energy for the bees. It also provides energy for humans. Honey is high in carbohydrates. Honey is the only sweetener that also contains B vitamins, minerals, and protein.

For additional information:
California State Beekeepers Association
(209) 545-5359
Website: californiastatebeekeepers.com

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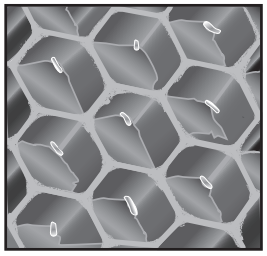
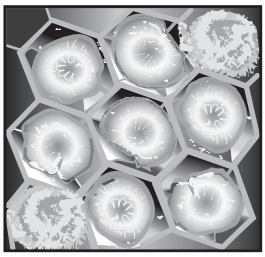
This is one in a series of fact sheets composed by the California Foundation for Agriculture in the Classroom (CFAITC). For additional educational materials: CFAITC, 2300 River Plaza Drive, Sacramento, CA 95833-3293 • (916) 561-5625 • (800) 700-AITC • Fax: (916) 561-5697
Email: info@learnaboutag.org • Website: LearnAboutAg.org

Bee Activity Sheet



1

The queen bee lays one egg in each cell.



2

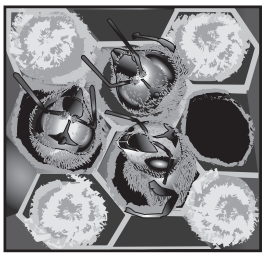
After three days, eggs hatch into larvae.

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.

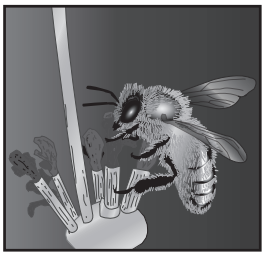


5

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.
- Bee hives are built and consist of many hexagons fitting together. Create an art piece using math shapes.
- 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 insects. Create an insect book of 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 bee 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.