Five **Fun Facts** About Citrus!

- The navel orange got its name because the button end resembles a belly button.
- Eating just one orange provides 100% of the recommended daily intake of Vitamin C.
- Moro or “blood” oranges are known for their burgundy color.
- Florida is the number-one producer of citrus fruits, and the majority of their crop is made into processed juice products.
- California is the leading producer of fresh citrus fruits (sold fresh rather than made into juice)!

Three **Fun Teaching Ideas**!

- Create a comic strip about the Asian citrus psyllid and California citrus trees. See the Asian Citrus Psyllid Fact and Activity Sheet.
- Bees are needed for citrus fruit to grow! Try the *Busy Bees* WE Garden activity to illustrate the role bees play in a fun and artistic way.
- Have students create a Venn Diagram comparing two citrus fruits. Make it a fruity-Venn, and draw fruit shapes instead of circles!

*Explore all the great citrus resources in this section!*
How Produced – Citrus trees are propagated asexually through a procedure known as grafting which fuses two different varieties of plants. In the case of citrus trees, one variety, the rootstock, is selected for its hardiness and the other variety, the scion, is selected for its high-quality fruits. The rootstock, grown from a seed, is typically a two- to three-year-old seedling while the scion is a bud from a mature tree. Through grafting, the scion fuses to the rootstock and becomes a new tree. In approximately five years, the tree produces the same variety of fruit that was budded onto the rootstock. The successfully grafted trees are sold to citrus growers through wholesale nurseries and are certified disease-free. There are approximately 270,000 bearing acres of citrus trees in California.

History – Oranges and lemons can be traced back to the ancient Middle East. In Sanskrit, the orange and lemon were called “Nagrunga” and “Nimbu” and their nectar was used both as a drink and as medicine. The Arabs called oranges “Naranji” while the Romans called them “Arancium.”

All navel oranges are related to each other and can be traced back to the Washington navel tree that still stands today in Riverside, California. Eliza Tibbets, a Riverside pioneer, is credited with planting California’s first two Washington navel trees in 1873. The resulting sweet seedless oranges helped launch Southern California’s modern citrus industry.

Varieties – Citrus fruits of one variety or another are available year-round from California, Arizona, and Florida. Navel oranges, a consumer favorite, are sweet, seedless and easy to peel. They are winter oranges, available November through May, and derive their name from their distinctive “button end.” Cara Caras are a type of Navel orange which is available December through April. They have a rich pink pulp, are naturally sweet, low in acid and seedless. Valencia oranges, which are excellent for juicing as well as for eating fresh, are summer oranges available February through November. California also produces Moro and Sanguinelli “Blood” oranges, named for their burgundy flesh.

Traditional lemons, such as the Eureka and Lisbon varieties, are a California classic and available all year long. They have a tart juice and a zesty peel. Traditional lemons are not typically eaten as a whole fruit but are wonderful flavor enhancers. Meyer lemons have a golden peel and, as a cross between a mandarin orange and a lemon, are less acidic than traditional lemons.

Desert grapefruit are harvested October through March while summer grapefruit are available May through September. Specialty citrus include Melo Golds and Oro Blancos, grapefruit varieties that are popular with those preferring a sweeter taste. Pummelos, or “Chinese” grapefruit, considered a delicacy among many Asian cultures, are the largest of all citrus fruits. Almost a dozen different mandarin and tangerine varieties, such as Clementines, Gold Nuggets, and Pixies, are available November through May. Most are easy to peel and have a lively flavor.

Commodity Value – While Florida is the number one producer of citrus fruits, the majority of their crop is made into processed juice products. California ranks second in the nation in total citrus production and is the leading producer of fresh citrus fruits. Both oranges and lemons are among the top 20 commodities produced in the state as listed by the California Department of Food and Agriculture. Oranges and their products are also one of California’s leading agricultural exports. Canada is the top importer with Korea, China, and Japan following closely. Lemons are also a high value export crop. Japan is the largest importer of California lemons.

Top Producing Counties – Most of the nation’s fresh citrus products are produced in California and Arizona. The ideal climate in these areas permits the growth of fruit that is as pleasing to the eye as it is to the taste. The leading counties in California citrus production include Tulare, Kern, Fresno, Ventura, and San Diego.

Nutritional Value – Citrus is well known for its high vitamin C content. In fact, just one orange supplies a full day’s requirement. Vitamin C, also known as ascorbic acid, is required for strong gums and healthy body tissues and for preventing a disease called scurvy. Oranges, lemons, grapefruit, and tangerines are great tasting, low calorie foods which are good sources of carbohydrates and fiber, and are low in sodium, cholesterol, and fat. Cara Cara “Power Oranges” are packed with vitamin C, A, fiber, and are a natural source of lycopene.

For additional information:
Sunkist Growers
Website: www.sunkist.com
Lesson Ideas

- Test the pH of a citrus variety and two non-citrus fruits. Create a hypothesis and compare your findings.
- Experiment with the effect lemon or lime juice has on cut avocados or apples. Explain the significance of pH and enzymes in cut fruit preservation.
- Use the citric acid of a citrus fruit to create electricity.
- Make orange, lemon, or grapefruit juice popsicles.
- Make a bar graph comparing the vitamin C content of different fruits, including citrus fruits.
- Observe and practice various grafting techniques used in growing citrus trees.
- Perform experiments that show the effects of freezing on citrus fruits.
- Compare the climates of different citrus growing regions of the world.
- Determine the percentage of water in a citrus fruit.
- Measure and graph the peel to fruit weight ratios of several different citrus fruits.

Fantastic Facts

1. Citrus fruit trees are reproduced by grafting.
2. Meyer lemons are known for being less acidic and golden in color.
3. All citrus fruits have high quantities of vitamin C.
4. The navel orange got its name due to the button end resembling a belly button.
5. California and Arizona produce most of the United States’ fresh citrus fruit.
6. Florida produces the most citrus fruit.
7. One orange contains 100 percent of a person’s recommended daily intake of vitamin C.
8. Moro and Sanguinelli orange varieties are known for their burgundy colored flesh.

Introduction: From pummelos to pixies, citrus fruits come in a wide range of sizes. They also differ in quantity of segments, presence of seeds, and volume of juice.

Objective: Students will examine a variety of citrus fruits. They will estimate and then measure the quantitative characteristics of the fruit.

California Standards: CC Math: 3-4.MD.2,4; 5.MD.2; 6.SP.4; HS.N-Q.1,2,3

Materials: A variety of whole citrus fruits (oranges, limes, grapefruit, lemons and tangerines), knife, paper towels, juicer (optional), string, ruler, balance, crayons.

Procedure:
1. Have students predict how many segments and seeds they will see when the fruits are cut cross-wise. Plot the estimates on a graph. Use unit fractions as appropriate.
2. Weigh each fruit whole and record the results. Measure the circumference using a string and a ruler. Plot the results on a graph.
3. Cut the fruit cross-wise and count the number of segments and seeds. Record and chart the results and compare to the estimates.
4. If seeds are present, remove and dry for planting at a later date.
5. Use the juicer to remove the juice from the fruit. Reweigh the citrus halves to determine the juice content of the citrus fruit. Plot the fruit weight and juice weight on a graph.
6. Mix the juices to make a citrus drink for the class to enjoy.
Busy Bees

Fruit trees must be pollinated to produce fruit. Pollen grains are transferred from the male flower part to the female flower part by wind, water, birds, bees and other insects. Bees are attracted to the nectar and pollen of fragrant flowers. The bee stops at a flower to suck the nectar, and the pollen grains get stuck to the bee’s body. When the bee moves to another flower, the pollen grains are transferred to the second flower. More than 80 percent of crop pollination is accomplished by bees.

1. Write the following journal prompt on the board: “Do you think bees are helpful or harmful? Describe.” After students brainstorm and write their answers down, ask them to share with the class.

2. Distribute green paper plates and craft supplies. Instruct students to illustrate and narrate the pollination cycle of bees on the paper plates. Use yellow pom-poms to depict the bee. Each quadrant of the plate should explain a different step of the pollination cycle:
   a. The bee is looking for food.
   b. The bee lands on the flower and sips the nectar. Pollen gets stuck on its body.
   c. The bee flies away, looking for more food.
   d. The bee lands on a new flower with pollen from the last flower. The pollen is transferred.

3. Use brown construction paper to create a tree trunk. Attach to the bottom of the plate with tape.

4. Ask each student to explain the pollination story to a partner using their completed visual aid.

Objective: Students will identify each step of the pollination cycle and understand the importance of bees in agriculture

Materials:
- Green paper plates
- Circle template, divided into quadrants
- Brown construction paper
- Crayons, colored pencils or markers
- Tape
- Yellow pom-poms

Vocabulary:

**Nectar**: a sweet liquid for pollinators that is produced by flower glands called nectaries.

**Pistil**: the female part of the flower including the stigma, style and ovary.

**Pollen**: the fine, powder-like material produced by the anthers of flowering plants.

**Pollen basket**: a smooth, slightly concave surface of the outer hind leg of a bee that is fringed with long, curved hairs that hold the pollen.

**Stamen**: the male part of the flower consisting of the anther and filament.

California Standards

**Kindergarten**: ELA CC: SL. K.1,5
NGSS: K-LS1-1, K-ESS3-1

**Grade 1**: NGSS:1-LS1-1

**Grade 2**: ELA CC:SL.2.1,5
NGSS:2-LS2-2

**Grade 3**: ELA CC: SL.3.1,5
NGSS:3-LS1-1, 3-LS2-1

This lesson has been adapted from Virginia Agriculture in the Classroom curriculum. For additional educational resources, visit AgInTheClass.org.
**Invasive Species Fact Sheet**

**Asian Citrus Psyllid**

**Background** – Invasive species are organisms that are moved by nature, people, or animals into an ecosystem where they have not been previously found. Some of these organisms are spread naturally or accidentally by people, while others are spread intentionally, without understanding the harm they might cause. Although most of the organisms brought into our state cause no harm, a few are able to thrive in California to the detriment of native ecosystems, recreation, agriculture, including specialty crops, infrastructure, and public or animal health. These invasive species include plants and animals, insects and other arthropods, and pathogens.

**Description:** A tiny bug called the Asian citrus psyllid is a big problem for citrus growers, home gardeners, and anyone who enjoys eating citrus. The Asian citrus psyllid threatens all citrus varieties and a few ornamental plants, because it can transfer a bacterium that causes huanglongbing [hwang-long-bing] (HLB) disease, also known as “citrus greening disease.”

The Asian citrus psyllid adult is as small as a sesame seed and has mottled brown wings. When the adult feeds it tilts its hind end at a 45-degree angle, making it look like a thorn on leaves and stems. Female Asian citrus psyllids lay hundreds of eggs in their lifetime, usually on new shoots and leaves. Asian citrus psyllid juveniles, or nymphs, are yellow in color and produce sugary ‘honeydew’ from the plant liquids they eat. Waxy, white tubules can be seen extending from their hind ends to move honeydew away from their bodies so they don’t drown in it.

**Habitat:** The Asian citrus psyllid and HLB came from southern Asia and citrus psyllids were first discovered in North America, in Florida in 1998. The Asian citrus psyllid has since spread through parts of the United States and Mexico. HLB is also gradually spreading along with the psyllid. Psyllids feed on leaves and stems of all citrus varieties.

**How Asian citrus psyllid and HLB are spread:** The Asian citrus psyllid spreads by flying from citrus tree to citrus tree and HLB spreads when an Asian citrus psyllid picks up the bacteria by feeding on an infected plant, then flies to another plant and feeds again. Psyllids can travel long distances when people transport infested plants or plant debris from one area to another. This can lead to infestations in entirely new regions or states.

**Why it is a problem:** The Asian citrus psyllid is dangerous because it can infect citrus trees with the bacterium that causes HLB, the worst citrus disease in the world. There is no cure for the disease and infected trees will eventually die. Homeowners and farmers must remove and destroy infected trees to prevent further spread of the disease.

HLB has killed many citrus trees in Asia, India, parts of the Middle East, South America, and Florida, and is now threatening citrus production in California, which is a $2.1 billion industry. California is the nation’s primary source of fresh market oranges, producing 80 percent, and also supplies 87 percent of the nation’s lemons.

**How it affects California specialty crops:** Many of the affected crops are California specialty crops. Specialty crops are fruits and vegetables, tree nuts, dried fruits, and horticulture and nursery crops (including floriculture). Many of the fruits, nuts, and vegetables eaten in the United States are grown right here in California. The Asian citrus psyllid could destroy these citrus crops including orange, lemon, lime, mandarin, kumquat, and grapefruit.

**How you can help:** Only purchase citrus trees from a good nursery close to your home and do not transport citrus trees to other areas. Anyone with citrus trees should inspect young leaves whenever watering or pruning. Always bag or dry out citrus prunings before disposing of them so psyllids don’t hitch a ride to new places. Before transporting fruit, remove stems and leaves to make sure there are no psyllids. If an Asian citrus psyllid is found, report it to local agriculture authorities.

**For Additional Information:**
California Department of Food and Agriculture
1220 N Street
Sacramento, CA 95814
Pest Hotline: (800) 491-1899
www.cdfa.ca.gov/plant/acp
www.californiacitrusthreat.org
Asian citrus psyllid nymphs can be identified by the waxy tubules that they secrete.

Illustration by: Gwen Conville

Asian Citrus Psyllid Activity Sheet

Fantastic Facts

1. What is the Asian citrus psyllid?
2. What does the Asian citrus psyllid adult look like on leaves and stems?
3. How do you cure trees infected with huanglongbing disease?
4. What percentage of fresh oranges sold in the U.S. are grown in California?
5. Name two things you can do to help stop the spread of Asian citrus psyllid.

1) A tiny insect that threatens citrus 2) A thorn 3) No cure 4) 80% 5) Buy local plants, inspect citrus fruit and trees, wipe off fruit and remove leaves and stems, bag or dry out green waste

Lesson Ideas

• Create a comic strip featuring the Asian citrus psyllid and its destruction of citrus.
• Research the latest psyllid appearances and mark on a map how close the psyllid is to your home.
• Write a persuasive essay on the importance of keeping pests like the psyllid out of California.
• In groups, create a psyllid model out of recycled materials. Give each creation a creative name.

Lesson Plan: Stop the Psyllid

Introduction: To understand the economic impact of Asian citrus psyllid and huanglongbing disease, students will act as citrus growers managing a navel orange farm. ACP and HLB will be introduced into the orchard and students will calculate the point at which their orchard is no longer profitable.

Materials:
• You Tube Video: “Deadly Huanglongbing Disease Threatens California Citrus” www.google.com/vUczj6
• You Tube Video: “Detecting Asian Citrus Psyllid” www.google.com/sD3ccM
• Paper, colored pencils

Procedure:
1. Play both videos and discuss psyllid identification and damage caused by HLB disease.
2. Have students pair up to be “farmers” who own a 100-acre orange farm.
3. Project the template found at www.LearnAboutAg.org/resources/fact/asian_citrus_temp.pdf. Students should use this template to draw their own chart to show what’s happening in the citrus orchard at each stage of ACP infestation.

Chart boxes should be large enough for students to draw a picture of the orchard and write down the costs associated with ACP and HLB.

4. Students should use the following information to predict when the citrus farm is no longer profitable:
   • Trees take at least 5 years to start producing fruit.
   • HLB disease takes several years to start affecting fruit production. It can kill a tree in about five years. Diseased trees must be removed.
   • There are 100 trees per acre in the orchard
   • Profit per acre = $2,500 ($25/tree)
   • Annual cost of pesticides to control ACP = $500/acre applied every year after ACP has been detected
   • Tree replacement costs = $25/tree
   • At what point is it no longer profitable to farm citrus?
5. Why is it important to stop the spread of Asian citrus psyllid and HLB?