



The Book Planter



Ag in the Classroom

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March 2020: *The Tree Lady*
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Kate Sessions could not imagine living somewhere without any trees. She grew up in northern California, surrounded by redwoods and large pine trees and it was there that she developed a love of trees and plant life. She was the first woman to graduate from the University of California with a science degree. After she graduated, she took a teaching job in San Diego—a place with little to no trees at the turn of the 20th century. Kate set her mind to change that, and started a campaign to transform San Diego into the beautiful city full of gardens, parks, and trees that it is today. Kate's legacy still lives on through the lush city now, more than 100 years later.



Fun Facts

- North Carolina has over 70 significant gardens, including historical gardens, rose gardens, botanical gardens, arboretums, natural gardens, and demonstration gardens.¹
- In 1979, North Carolina Cooperative Extension in Wake County trained their first master Gardener volunteer as part of the Master Gardener program. The NC Cooperative Extension Master Gardener program helps provide unbiased, research-based information on gardens, lawns, and landscapes to the general public.²
- Master Gardeners are under the guidance and directions of the Extension agents, and must complete a 40-hour training program, pass an examination, complete at least a 40-hour internship, and each year, maintain volunteer and continuing education hours.²
- In 1898, Sallie Walker Stockard became the first woman to graduate from the University of North Carolina. Women had been allowed to attend the summer teachers' institute in Chapel Hill since 1878, but Stockard was the first female student to earn a degree from the university.³

Before Reading Questions⁴

Use these before reading the story to help students activate background knowledge and make predictions.

1. Why is the girl lying down among the trees (on the cover)?
2. What is the title of the book?
3. Who is the author of the book?
4. Do you think this is fiction or non-fiction and why?

During the Story Questions⁴

Use these while reading the story to help students interpret the action and content.

1. How long ago was 1860 and why didn't girls "get their hands dirty" back then? (p.2)
2. How would you feel if you were discouraged from learning about science? (p.4)
3. What other women have we read about to be the first to accomplish their goals? (p.10)
4. Why did people think trees couldn't grow in San Diego? (p.16)
5. Have you ever been to San Diego? (Allow for class discussion. Point out the trees on p. 20, and ask if they recall seeing these in San Diego. Then, ask if anyone has seen these trees/plants elsewhere.)
6. How long do you think it took to plant all the trees in Balboa Park? (p.26)

After Reading Questions⁴

Use these after reading the story to help students understand what they just read.

1. Why did the author choose to repeat the same word throughout the story?
2. What message did the author want us to take away from this story? (p.32)
3. How do you think cities like San Diego would look without Kate Sessions?
4. Why do you think Kate is called the *mother* of Balboa Park?
5. Discuss some of the challenges Kate Sessions overcame so long ago. Why do you think Kate persevered despite these challenges? How have some of these things changed over the years?
6. What was "different" about Kate?
7. Why do you think Kate loved trees like she did?
8. What does the author mean when he compares trees to umbrellas?
9. Did it surprise you that Kate became a teacher after college? Why or why not?
10. What did Kate wish to do rather than teach?
11. How did Kate change the city?
12. How did the pictures in the book help you to understand the story?
13. Why do you think the author wrote this story?
14. Is there a lesson to be learned from the story? What might it be?

Small Group Activities⁴

1. Discussion Activities

- Conduct a picture walk and let each student find their favorite page and tell why.

- Ready p. 5-6 and discuss the similes the author used to help us visualize the story.
- Ask these questions about the vocabulary words in the story.
 - Can you think of anything taller than a Redwood tree?
 - Share about a time when you were discouraged.
 - What does it mean to be sheltered?
 - What would you like to look at under a microscope?
 - What kinds of animals graze in a field?

2. Writing Activity

- Write about all of the uses that trees bring to the world. This could be products or activities.

3. Extension Activity

- Talk about the phrase “money doesn’t grow on trees,” and how fortunate we are to have lots of trees around us. If anything could grow on trees what would you like to see on trees? What would you like there to be an abundance of in the world? Why? Ask students to draw their tree. They can cut pictures out of magazines to put on their tree—the pictures don’t have to just be things; they could also include words, such as “love,” “kindness,” or “candy!”

Tree Research

1. Ask students to make a list of the trees pictured and mentioned on pages 4, 17, and 19 in *The Tree Lady*.
2. Ask students to research each tree, using the [USDA Plant Database](#) (full link in **Links** section). They will need to find the following information for each:
 - a. Family name
 - b. Type of plant, e.g. Perennial, tree, annual, etc. (on the database this is the Duration section)
 - c. Where the plant is native
 - d. Suitability/Use (this information can be found by clicking Characteristics)
 - e. If the plant is written by the scientific name, ask students to write the common name of the plant, and vice versa—if the common name is written, ask them to determine the scientific name.
3. Ask students if these plants could grow in North Carolina. Start by saying, “Is North Carolina like San Diego in climate?” In some places, North Carolina can be very hot and dry. Where are those places?
4. Certain trees grow in specific regions of the United States, and that is based around environmental factors:

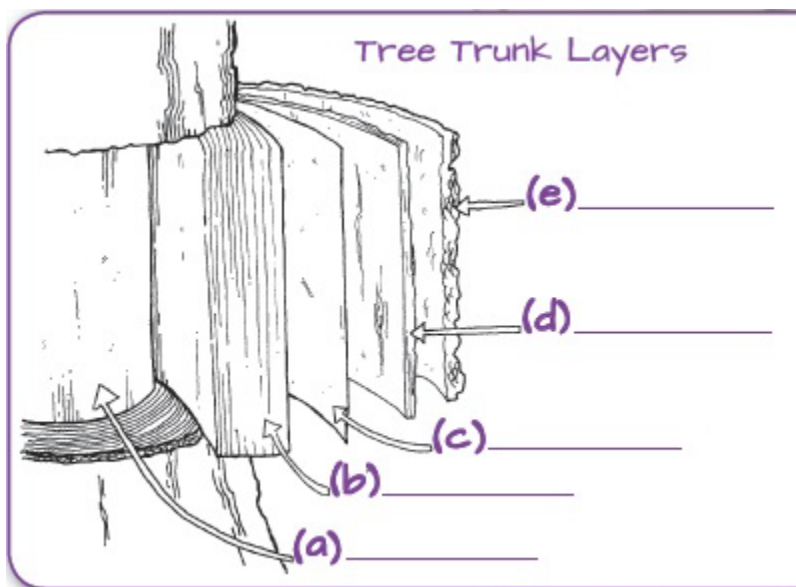
- a. Frost free periods (growing season) – think about how some trees lose their leaves in the winter, and the sign of flowers or new leaves in the spring or summer indicates the change of the season.
- b. Average temperature (growing degree days) – some plants can only grow when the temperature has risen above a certain degree.
- c. Rainfall – some plants rely on water for growth, others do not. In *The Tree Lady*, we learn that many of the trees that Kate Sessions sourced to plant in San Diego did not require a lot of water, and preferred the hot, desert-like climate.

Tree Machine⁵

By acting out the parts of a tree, students will learn about tree structure and function. Engage students by asking them to think about what trees need to survive (food, sun, water, air, and space). Discuss how a tree might get these requirements, especially since they can't move around the way animals can.

- How does a tree get the water it needs?
- How does a tree get the food it needs? How does water and food get around to all parts of the tree?

Explain that in addition to having leaves and roots, trees have special layers in their trunk and branches that help them move nutrients and water to every part of the tree. The trunk and branches also contain a growing layer of cells that create the tree's annual growth rings, making the trunk, branches, and roots thicker each year. Review the following tree parts and have students label the diagram.



- **Heartwood** – forms the central core of the tree. It is made up of dense dead wood, and it provides strength.
- **Xylem** – brings water and nutrients up from the roots of the leaves. Older xylem cells become part of the heartwood.
- **Cambium** – a very thin layer of growing tree tissue. It makes cells that become new xylem, phloem, or cambium.
- **Phloem** – carries sap from the leaves to the rest of the tree. At certain times of the year, phloem may also move stored sugars from the roots up to the rest of the tree.
- **Outer bark** – protects the tree from injury caused by insects, animals, plants, diseases, and fire.

Using the chart below, have students build a “Tree Machine” by coming up with their own actions and chants to represent the structure and function of the tree parts reviewed above. The chart has been started to help you. (Hint: The chant helps to determine the function!) To reinforce learning, have students shout the chant and perform the action chosen for each tree part.

Structure	Function	Chant	Action
Roots	Anchor tree, absorb water and nutrients	“We anchor!”	Lay down and hold onto the ground tight
Leaves	Make food through photosynthesis	“We make food!”	Flutter your hands
Heartwood		“I support!”	Flex your muscles
Xylem		“I pump!”	
Cambium		“I make new cells!”	
Phloem		“I carry sap!”	
Outer Bark		“I protect!”	Hold up hands or cross arms to make a shield

Surrounded by Plants⁶

Plants are vital to all life on Earth. They mean survival. Plants are the base of food for all humans and animals. They can harvest energy from the sun and exchange gas. (Plants use carbon dioxide from the air and convert it into oxygen.) Plants use the energy from sunlight to convert raw materials from the Earth into carbohydrates, fats, and oils. Humans depend on plant materials for food, feed for livestock, fiber, fuel, medicine, aesthetic value, and much more.

Plants are affected by environmental factors, including frost-free periods or growing season, mean average temperature or growing degree days, and rainfall. These factors create unique growing conditions across the United States and throughout the world.

1. Ask students to think about the many times a day they touch or eat things that come from plant or tree materials. Our world consists of an unimaginable number of products originating with plants and trees. Students are likely touching several as they sit in class. Plants are a major part of daily life in several forms.
2. As a class, make a list of plant or tree products found in the classroom.
3. Discuss how plants and trees are vital to all life on Earth for two reasons:
 - a. Harvesting the sun - Plants use the energy from sunlight to convert raw materials from the Earth into carbohydrates, fats, and oils.
 - b. Gas Exchange - Plants use carbon dioxide from the air and convert it into oxygen. The process of food production and gas conversion is called **photosynthesis**.
4. What are some ways humans use plant/tree material? After determining these categories, ask students to give examples for each.
 - a. Food (fruit, vegetables)
 - b. Feed for livestock (corn, soybeans, row crops grown by farmer and ranchers)
 - c. Fiber (our clothes)
 - d. Fuel (ethanol)
 - e. Medicine (aloe, aspirin, Echinacea, ginkgo, hemp, Saint John's Wort)
 - f. Aesthetic Value (house plants, office plants, landscaping, etc.)
5. Finally, ask the following questions.
 - a. List two environmental factors influencing plants.
 - b. What are the major crops grown in North Carolina? (You may narrow this down by asking specific location, such as your county)
 - c. Explain how growing conditions in North Carolina compare to other regions of the United States.
 - d. Explain how plants "harvest" energy from the sun.
 - e. Name two ways humans use plants.

Gumdrop Tree Building⁷

Materials:

- Gumdrops
- Toothpicks
- Rulers

Ask students to construct the tallest possible tree using

A large, colorful pyramid made of jelly beans on sticks, with red, green, and white jelly beans arranged in a triangular pattern.

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Materials:
Plan:
Measurements: Simple Tree 1) 2) 3)
What worked well with your tree construction?
What was challenging?
What would you do differently next time?

- North Carolina Women's History Time Line
<https://www.ncmuseumofhistory.org/learning/educators/timelines/north-carolina-womens-history-time-line>
- Kate Sessions, San Diego Women's Hall of Fame, 2006 (video)
https://www.youtube.com/watch?v=9JmBhL_R-e0
- USDA Plant Database
<https://plants.sc.egov.usda.gov/java/>
- Tree ID: Leaves (info graphic)
<https://www.ncforestry.org/wp-content/uploads/2017/08/Tree-Identification-Leaves.jpg>
- USA Forest Map
https://www.srs.fs.usda.gov/pubs/misc/misc_reston.pdf

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1. <https://gardening.ces.ncsu.edu/2017/07/learn-more-about-public-gardens-in-north-carolina/>
2. http://www.ncstategardening.org/extension_master_gardener/index.php
3. <https://www.ncmuseumofhistory.org/learning/educators/timelines/north-carolina-womens-history-time-line>
4. <https://static1.squarespace.com/static/56663dee841abafca76d6f46/t/5a1667d1652dea2e1adb03fe/1511417811044/Tree+Lady%2C+The.pdf>
5. https://www.plt.org/wp-content/uploads/pdf/PLT_Act63_Tree_Factory.pdf
6. https://www.agclassroom.org/teacher/matrix/lessonplan.cfm?lpid=306&search_term_lp=carbon
7. <http://jenniferfindley.com/christmas-stem-activity-gumdrop-christmas-tree/>

K-5 Subject Areas

Reading, Speaking and Listening, Science, and Social Studies

Common Core/Essential Standards

Reading

- **RL.K.1** With prompting and support, ask and answer questions about key details in a text.
- **RL.1.1** Ask and answer questions about key details in a text.
- **RL.2.1** Ask and answer such questions as who, what, where, when, why, and how to demonstrate understanding of key details in a text.
- **RL.3.1** Ask and answer questions to demonstrate understanding of a text, referring explicitly to the text as the **basis for** the answers.
- **RL.4.1** Refer to details and examples in a text when explaining what the text says explicitly and when drawing inferences from the text.
- **RL.5.1** Quote accurately from a text when explaining what the text says explicitly and when drawing inferences from the text.
- **RI.K.1** With prompting and support, ask and answer questions about key details in a text.
- **RI.1.1** Ask and answer questions about key details in a text.
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- **RI.5.1** Quote accurately from a text when explaining what the text says explicitly and when drawing inferences from the text.

Speaking and Listening

- **SL.K.4** Speak audibly and express thoughts, feelings, and ideas clearly.
- **SL.1.4** Produce complete sentences to describe people, places, things, and events with relevant details, expressing ideas and feelings clearly.
- **SL.2.4** Tell a story or recount an experience with appropriate facts and relevant, descriptive details, speaking audibly in coherent and complete sentences.
- **SL.3.4** Report on a topic or text, tell a story, or recount an experience with appropriate facts and relevant, descriptive details, speaking clearly in complete sentences at an understandable pace.
- **SL.4.4** Report on a topic or text, tell a story, or recount an experience in an organized manner, using appropriate facts and relevant, descriptive details to support main ideas or themes; adjust speech as appropriate to formal and informal discourse.
- **SL.5.4** Report on a topic or text or present an opinion, sequencing ideas logically and using appropriate facts and relevant, descriptive details to support main ideas or themes; adapt speech to a variety of contexts and tasks.

Science

- **1.L.1.1** Recognize that plants and animals need air, water, light (plants only), space, food and shelter and that these may be found in their environment.
- **1.L.2.1** Summarize the basic needs of a variety of different plants (including air, water, nutrients, and light) for energy and growth.
- **3.L.2.1** Remember the function of the following structures as it relates to the survival of plants in their environments:

- • Roots – absorb nutrients
- • Stems – provide support
- • Leaves – synthesize food
- • Flowers – attract pollinators and produce seeds for reproduction
- **3.L.2.2** Explain how environmental conditions determine how well plants survive and grow.
- **5.L.2** Understand the interdependence of plants and animals with their ecosystem.

Social Studies

- **K.G.2.2** Explain ways people use environmental resources to meet basic needs and wants (shelter, food, clothing, etc.).
- **K.G.2** Understand the interaction between humans and the environment.
- **1.G.2** Understand how humans and the environment interact within the local community.
- **2.G.2** Understand the effects of humans interacting with their environment.

MATURE TREES

are like animal apartment houses. At the top, a tree's branches provide homes for birds and many insects. In the middle, a mature tree's woody trunk provides food for a variety of insects as well as a site to lay their eggs. At the bottom, the roots provide a support system for burrowing animals such as chipmunks and other small mammals. The berries and nuts of mature trees serve as food for animals like squirrels, deer and turkeys. As a mature tree passes its prime and reaches its life expectancy, transpiration and growth rates slow down.

Life Cycle of a TREE

Trees eventually die or are killed by disease, fire or insects. But even dying or

DEAD TREES

are very valuable for animals. Many insects feed on the dead wood and woodpeckers feed on the insects. Old woodpecker nest cavities provide a hiding place from predators, a place to raise young, as well as protection from the weather for squirrels, bats, owls, wood ducks and more.

Young saplings must compete with other trees and plants for sunlight, nutrients, water and space. At this point in their lives trees play a critical role in keeping our air and water clean. They are transpiring water and oxygen and absorbing carbon dioxide at their highest rate and their rapidly growing root systems help prevent soil erosion and absorb more nutrients and minerals from the soil than older trees do. Some

SAPLINGS

begin to provide food for birds and mammals, and they provide nesting sites for some types of songbirds.

When a dead tree falls, its nutrients are recycled back into the soil through decomposition. Termites, sowbugs and beetles feed on the rotting wood. Other insects, such as centipedes and spiders, feed on the sowbugs and other scavengers that feed on the decaying log. Mice, shrews, snakes, lizards, frogs and salamanders live under fallen logs because they find protection from predators and harsh weather here. If large enough, animals such as a bear may even use

FALLEN LOGS

as a winter den.

T

rees, like all living things, have a life cycle that includes birth, growth, aging and death. Along the way, they face risks of injury from animals, fire, insects and disease. As trees go from birth to death, their physical form and their role in the ecosystem changes. Throughout the cycle, trees provide the raw material for more than 5,000 products that we use every day.

By looking at the annual growth rings in a tree's cross section, one can learn about past influences on tree growth such as crowding, fire, drought or disease and about changes in the environment. Growth rings in a living tree can be examined by taking a core sample from the tree.



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As part of the forest community,

SEEDLINGS

run the risk of being trampled on by animals. This tender growth also provides excellent browse for deer. Only a small portion will still be alive a year later.

Some trees sprout from the stump or roots of a parent tree, but most begin as

SEEDS

The majority of a tree's seeds will be destroyed by fungi or other decomposers, eaten by birds or mammals or fall to places where they cannot grow. When those seeds that are lucky enough to survive germinate and begin to grow, a tree is born.

