The Book Planter
Ag in the Classroom
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From Cone to Pine Tree
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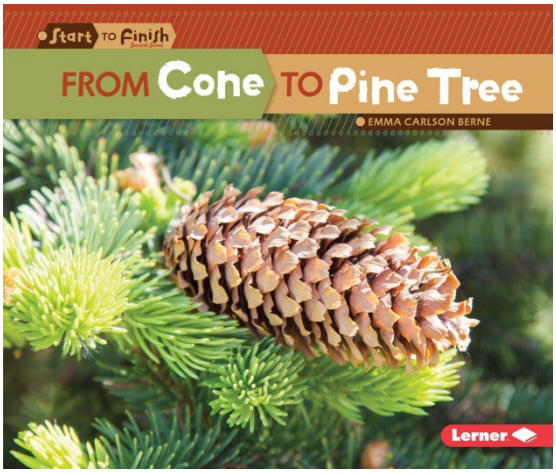

Pinecones grow into pine trees. How do they do it? This book takes you from start to finish of the lifecycle of a pine tree, explaining how pinecones are formed, how they are fertilized, and how pine trees grow. Pine trees are evergreens. They stay green all year long, and some species are used for Christmas trees! This activity sheet will explore the differences between evergreen tree species, and how these species survive cold climates. Students will visualize the pine tree lifecycle. Students will also design the perfect conifer, and learn about products we get from pines.

Fun Facts

- The State Tree of North Carolina is the Pine. Despite popular belief, no single species of pine is designated as the official tree of North Carolina. Many people believe that the longleaf pine is the state tree, due to the State Toast, which begins, “Here’s to the land of the longleaf pine…”[1]
- North Carolina ranks second in the nation for Christmas tree production.
- More than 90% of all the Christmas tree species grown in North Carolina are the Fraser fir variety.[2]
- There are approximately 400 choose-and-cut Christmas tree farms in North Carolina.[2]
- Forestry farming (growing trees for timber) is a way that farmers can earn revenue. Forestry farming assists with the prevention of soil erosion, produces pine straw used for landscaping, pulp for paper products, and lumber for construction.[3]

Vocabulary
Egg cells: very small parts that form an egg
Fertilizes: mixes with egg cells to make new life
Mature: fully grown
Pollen: a powder that a male plant releases
Temperature: how hot or cold something is
Evergreen: a plant that does not seasonally lose its leaves
Conifer: a tree that bears cones and evergreen needle-like or scale-like leaves
Renewable resources: natural resources that we are able to replenish through natural reproduction or recurring processes

Interest Approach – Engagement[4]

1. Ask students to name a few things that farmers produce. Allow the students to raise their hands and name a few items. Once the students are actively thinking about what farmers grow/produce, tell them that you are going to play a guessing game and that you are going to give them some clues. Inform them that in some places farmers use a helicopter to harvest this product. What is it? Use the following clues:
    a. It is harvested one time per year.
    b. It is not a food crop.
    c. It is not produced by animals. (If needed help students conclude that it is produced by plants.)
    d. It takes 6-10 years to grow.
    e. It has needles instead of leaves.
    f. It is primarily green and cone-shaped.
    g. It is most associated with the Christmas holiday.
2. Show the video clip of a helicopter tree harvest. Clarify that not all Christmas trees are harvested this way, but some are depending on the location of the farm. (in **Links** section)
3. Ask students where they think the tradition of cutting and decorating evergreen trees in December comes from. Chances are, most will associate the tradition with the Christian holiday of Christmas.

Pines, Spruces, Firs, and More[4]

1. Show your students a picture of a fir or spruce tree and ask them what it is. Chances are, they'll call it a pine tree. You'd be amazed how many children's books do the same! There are dozens of species of evergreen trees both native and introduced, and only a handful of those are actually pines. Welcome to the world of conifers—fir, spruce, juniper, cedar, cypress, larch, pine, and more!
2. Introduce your students to a simple, handy, alliterative phrase they can use to differentiate among conifer types. "Pine needles come in packets. Spruce needles are square. Fir needles are flat and friendly." Or an even quicker way to remember it: "Pines come in packets, spruces are square, firs are flat and friendly." This phrase relates to the shared characteristics of trees in each of these three main groupings of conifers. Pines share the characteristic that their needles grow in packets or bundles, called "fascicles." Spruce needles are square in cross-section, so when you roll one in your fingers, you'll notice the bump-bump-bump of the squared sides. Fir needles are flat, and when you grab a fir branch, it's soft to the touch, not prickly like pines and spruces. This phrase over-simplifies the real-life story of diversity in the forest, since, for instance, there are conifer species like Eastern hemlock that have flat needles but aren't firs, but it's a great starting point.
3. Provide a hands-on opportunity for your students to see and identify different species of conifer. Choose one of the following activities:
    - **Field Trip to a Christmas Tree Farm:** If possible, have students work in small groups to identify as many different species of conifers as possible during their

site visit, using the *Identifying Conifers* activity sheet. Ask the Christmas tree farmer to explain his or her reasons for growing the particular conifer species found on this farm. What are the advantages and disadvantages of each? What challenges does each species offer, from planting through harvest?
    - **Tip:** If there aren't any Christmas tree farms in your area, your local park or even your school grounds may have a variety of conifer species that your students could observe.
- **Field Trip to a Local Forestry Farm**: Contact your local North Carolina Forestry Service office and ask about touring a local forest. The forester can explain the uses of trees grown on the property, and how the land is managed. They also have lots of free educational resources and giveaways. Even if there are no local forests, the Service can come to your class to talk to your students.
- **In-class Conifer Activity:** Bring as many samples of conifer tree boughs as you can find. Have students sit together in pairs, and give each pair a clipping of pine, spruce, and fir. Talk through the process of noticing the needle packets on the pine twig, the square needles on the spruce twig, and the flat, soft (not prickly) needles of the fir.
    - **Optional:** Add an art project to this activity by helping students make a small wreath or another Christmas decoration with the evergreen clippings.

Pine Tree Lifecycle

1. Using *From Cone to Pine Tree* as a guide, ask students to write, in their own words, the steps of how pinecones become pine trees (use the list below as a guide).
2. Next, ask the students to create a booklet (booklet page attached to this activity sheet) in which they can draw each step. They may choose to draw pictures similar to that in *From Cone to Pine Tree*, or choose to use certain details from the book. This is up for the students' interpretation, as long as they include the major steps, with descriptions and labels. Students will also need to create a cover for their booklet using a blank sheet of printer paper or construction paper.

<u>Steps</u>:

- Pinecones on a pine tree (labeling the female and male pinecones).
- Male pinecones releasing pollen.
- Pollen traveling to fertilize female pinecones.
- Seeds growing inside pinecones.
- Pinecones opening up.
- Pinecones scattering seeds.
- Seeds growing into small plantlets (baby pine trees).
- Small trees growing larger.

Getting a Sense of Conifers[4]

1. Begin by asking your students how trees survive the dark, dry, cold months of winter. Every fall, many trees, like maples and oaks, lose their leaves and stand bare all winter long. However, conifers are far different. Except for a very few species—like the American larch, which loses all its needles in fall like a deciduous tree—conifers keep most of their leaves throughout the year and stay green throughout the cold winter months.
2. Give each student one copy of the *Design a Winter-Proof Conifer* activity sheet (in **Links**, and attached to this activity sheet). Explain that scientists have studied conifers to learn about how their features help them survive the winter. Your students can ponder this on their own as they complete the activity sheet.
3. After completing the worksheet, explain that conifers have many amazing characteristics that help them survive and thrive in a tremendous variety of climates around the world, from coastal rain forests to the frigid northern reaches of Siberia.
4. Have students complete the activity sheet, *Surviving Winter- The Advantages of Being a Conifer* with your help if needed. (See the Teacher's Key found in the **Links**)

A Four Season Job[4]

1. What are the characteristics of a picture-perfect Christmas tree? *(conical, bushy, fully green, symmetrical.)* On a Christmas tree farm, farmers put a great deal of time and effort into nurturing these qualities. It takes a lot of work because natural elements, like fire, wind, snow, ice, insects, and diseases, tend to shape the tree differently.
2. White pine weevils, for instance, kill the terminal shoot (top of the main stem) of white pines, which causes one or more side branches to grow upwards and assume the role of terminal shoot, greatly changing the shape of the tree. Perpetual high winds can cause “Krummholz,” the deformation and stunting of conifers. And that’s just for starters. The list of natural elements that can damage conifers and reduce the economic value of Christmas trees is extensive.
3. Have each student pick an insect, disease, or other natural event (wind, ice, fire) and research its effect on conifers. These effects may be dramatically different for different conifer species. If your student chooses a complex element like fire, which has vastly different effects on different species, you might suggest that they limit their research to just one species (for instance, researching how Jack pines are shaped by fire).
4. Then have students create a 5-minute presentation on their findings. Encourage them to create visual aids that will illustrate their findings.
5. Have students share their presentations with their classmates.

Pine Products[5]

Materials:

- Paper Products: printer paper, library books, coffee filters, tissues, disposable diapers, postage stamps, paper towels, milk cartons, paper plates, receipts, newspaper, animal bedding, paper grocery bags, playing cards
- Solid Wood Products: lumber, tooth picks, popsicle sticks, birdhouses, canoe paddles, guitars, wood blocks, rulers
- Bark: cork, shoe polish, cosmetics, poultry bedding, garden mulch, cinnamon
- Wood Alcohols: Colognes
- Cellulose: Rayon clothing, floor tiles, toothpaste, carpeting and upholstery backing, football helmets and hardhats, luggage, placemats, sandwich bags
- Lignosulfates: cleaning compounds, ceramics, insecticides, hairspray, laundry stain remover, artificial vanilla flavoring

1. If possible, start this activity outside near a tree, so that students can look at the tree and name all the parts of the tree they know (bark, foliage, wood, etc.)
2. Ask the students to name some products they get from trees.
3. Discuss renewable resources and ask the students how trees qualify as a renewable resource.
4. Back in the classroom; ask for a volunteer to help you point out some of the products in the classroom that we get from trees. Start a list on the board. Have another volunteer walk you through their day, starting from the time he/she wakes up until he/she goes to bed, pointing out all of the forest products he/she uses throughout the day. Allow class discussion if other students have products to add to the list. Ask the class to consider what life would be like without some of these products.
5. Put some unusual forest products out on a table (see the materials list). See if the students can name which part of the tree the products came from, and which part of the product is made from trees. Example: paper comes from wood fiber. If time permits, allow students to research and report their findings to the class. Ask the students, "What surprised you the most about forest products? Name one thing you did not know before this activity that you learned about forest products."

Links

- Oregon Christmas Tree Harvest (video) https://www.youtube.com/watch?v=08K_aEajzNA
- Surviving Winter – The Advantages of Being a Conifer (worksheet) https://naitc-api.usu.edu/media/uploads/2016/12/06/Surviving_Winter_The_Advantages_of_Being_a_Conifer_worksheet.pdf
- Surviving Winter – The Advantages of Being a Conifer (Teacher's Key)

https://naitc-api.usu.edu/media/uploads/2016/12/06/Teachers_Key_Surviving_Winter_The_Advantages_of_Being_a_Conifer.pdf

- Design a Winter-proof Conifer (worksheet) https://naitc-api.usu.edu/media/uploads/2016/12/06/Design_a_Winter-proof_Conifer_worksheet.pdf

Sources

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2. https://www.ncfieldfamily.org/farm/farm-facts-christmas-trees/2/
3. https://www.ncfieldfamily.org/farm/what-are-the-challenges-and-benefits-of-forestry-farming/
4. https://www.agclassroom.org/teacher/matrix/lessonplan.cfm?lpid=537&search_term_lp=pine
5. http://www.ncforestry.org/wp-content/uploads/2013/07/Products-and-History.pdf

K-5 Subject Areas

Reading, Writing, 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.

Writing

- **W.K.2** Use a combination of drawing, dictating, and writing to compose informative/explanatory texts in which they name what they are writing about and supply some information about the topic.
- **W.1.2** Write informative/explanatory texts in which they name a topic, supply some facts about the topic, and provide closure.
- **W.2.2** Write informative /explanatory texts in which they introduce a topic, use facts and definitions to develop points, and provide a concluding statement or section.
- **W.3.2** Write informative /explanatory texts to examine a topic and convey ideas and information clearly.
- **W.4.2** Write informative /explanatory texts to examine a topic and convey ideas and information clearly.
- **W.5.2** Write informative /explanatory texts to examine a topic and convey ideas and information clearly.
- **W.K.5** Participate in shared investigation of grade appropriate topics and writing projects.
- **W.1.5** Participate in shared research and writing projects.
- **W.2.5** Participate in shared research and writing projects.
- **W.3.5** Conduct short research projects that build knowledge about a topic.
- **W.4.5** Conduct short research projects that build knowledge through investigation of different aspects of a topic.
- **W.5.5** Conduct short research projects that use several sources to build knowledge through investigation of different aspects of a topic.
- **W.K.6** With guidance and support from adults, recall information from experiences or gather information from provided sources to answer a question.
- **W.1.6** With guidance and support from adults, recall information from experiences or gather information from provided sources to answer a question.
- **W.2.6** Recall information from experiences or gather information from provided sources to answer a question.

- **W.3.6** Recall information from experiences or gather information from print and digital sources; take brief notes on sources and sort evidence into provided categories.
- **W.4.6** Recall relevant information from experiences or gather relevant information from print and digital sources; take notes and categorize information, and provide a list of sources.
- **W.5.6** Recall relevant information from experiences or gather relevant information from print and digital sources; summarize or paraphrase information in notes and finished work, and provide a list of sources.

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.2.1** Summarize the basic needs of a variety of different plants (including air, water, nutrients, and light) for energy and growth
- **3.L.2.3** Summarize the distinct stages of the life cycle of seed plants
- **5.L.2.1** Compare the characteristics of several common ecosystems, including estuaries and salt marshes, oceans, lakes and ponds, forests, and grasslands.
- **5.L.2.2** Classify the organisms within an ecosystem according to the function they serve: producers, consumers, or decomposers (biotic factors)

Social Studies

- **1.G.2.1** Explain ways people change the environment (planting trees, recycling, cutting down trees, building homes, building streets, etc.).
- **1.G.2.2** Explain how people use natural resources in the community.
- **2.G.2.1** Give examples of ways in which people depend on the physical environment and natural resources to meet basic needs.

Design a Winter-proof Conifer

Name _____

If you were going to come up with the best possible winter-proof design for a conifer, what would it look like?

1. What's the best shape for your tree? What shape will allow the most sunshine to reach its leaves? What shape will shed snow the best?

2. What would be the best shape, size, and texture for the leaves of your tree when it's cold, snowy, icy, and windy?

3. What other features would your tree have to survive the long, dark, cold, snowy winter?

4. Draw and describe the key features of your winter-proof conifer below.

Surviving Winter • The Advantages of Being a Conifer

Name _____

Conifers have many amazing characteristics that help them survive and thrive in a tremendous variety of climates around the world—from coastal rain forests to the frigid northern reaches of Siberia. Answer the questions below about conifer adaptations.

1. Most conifers are evergreen, meaning they keep most of their leaves year-round. How might this help them survive?

2. Conifer leaves are shaped like needles (or sometimes are like tiny scales, as for cedars and junipers). What advantage does this give them in winter?

3. Conifer needles remain on the tree for several years before falling off. How is this a helpful adaptation, particularly on sites with poor soil?

4. Conifer needles are shiny and waxy. How are these qualities useful in a wintery climate?

5. Conifers have very small pores in their leaves, compared with the pores in deciduous leaves, and these pores close more tightly than those on deciduous trees. What advantage does this give them?

6. In winter, water flows out of conifer cells and into the spaces in between the cells. How does this help them survive below-freezing temperatures?

7. Most young conifers and many mature conifers are conical in shape. Why is this a helpful trait in a winter climate?

8. The branches of many conifers attach to the trunk at an obtuse angle (meaning they point toward the ground). How might this help them survive the winter?

9. Conifer wood is very flexible and is made up of longer fibers than deciduous wood. Why is this a useful winter adaptation?

10. Many conifers produce a thick and sticky resin, that oozes out when the tree is wounded (it's what gives many conifers their distinctive aromas). How does this resin help a conifer survive?

Surviving Winter • The Advantages of Being a Conifer

1. Most conifers are evergreen, meaning that they keep most of their leaves year-round. How might this help them survive?
Having green leaves year-round allows evergreens to photosynthesize whenever the weather is warm enough.
This allows them to take advantage of warm spells in spring and fall (or, in warmer climates like the Pacific Northwest, throughout the winter).

2. Conifer leaves are shaped like needles (or sometimes are like tiny scales, as for cedars and junipers).
How might this help them survive?
Having small, needle- or scale-shaped leaves allows conifers to conserve water, which helps them survive summer and winter drought.

3. Conifer needles remain on the tree for several years before falling off. How does this help them survive, particularly on sites with poor soil?
Growing a new set of leaves each year takes a huge amount of energy and resources. By keeping their needles for several years, conifers save energy and nutrients and can live in poor soil that many deciduous trees, which need a great amount of nutrients to grow their annual crop of leave, could not survive in.

4. Conifer needles are shiny and waxy. How might this help them survive?
The smooth, shiny surface encourages snow to slide off, helping to prevent snow build-up and branch breakage.
A waxy coating helps conserve water in the leaves.

5. Conifers have very small pores in their leaves, compared with the pores in deciduous leaves, and these pores close more tightly than those on deciduous trees. How might this help them survive?
Small, tightly closing pores help conifer needles conserve water.

6. In winter, water flows out of conifer cells and into the spaces in between the cells. How does this help them survive below-freezing temperatures?
When cells freeze, they can rupture and die. But in a conifer there are many small, empty spaces around the plant cells. But sending fluid from within the cells out into these extracellular spaces, the cells themselves avoid freezing. The extracellular spaces can freeze without damaging the cells.

7. Most young conifers and many mature conifers are conical in shape. How might this help them survive?
The conical shape helps conifers shed snow easily and allows each branch to receive direct sunlight.

8. The branches of many conifers attach to the trunk at an obtuse angle (meaning they point toward the ground.
How might this help them survive the winter?
Many conifers grow in areas that receive a lot of snow in winter. If the branches slope downwards, they are more likely to shed the snow easily without breaking.

9. Conifer wood is very flexible and is made up of longer fibers than deciduous wood.
How might this help them survive the winter?
Flexible wood is well-adapted to withstand the heavy weight of snow and ice.

10. Many conifers produce a distinctly scented resin, secreted when the tree is wounded. How does this help a conifer survive?
When insects bore holes into a conifer or a branch breaks off during a storm, the tree secretes a gummy resin that fills hole or creates a coating over the ragged break. This scab-like resin helps protect the tree against further damage.