“Solutions-Oriented Learning” Storyline

2- Urban Forestry: The Needs of Trees

Storyline introduction and overview:

Trees grow all around us. Sometimes they are in large forests and sometimes they are single trees along the road or in our schoolyards. In this storyline, students explore cultural connections with trees, learn about the characteristics of trees, and discover what trees need to grow through hands-on activities, art, and literacy integration.

Urban Forestry NGSS Learning Progression: The 2nd grade storyline is part of a larger learning progression that includes students mastering standards pre-K to 12th grade. Take a look at how the 2nd grade performance expectations fit in a continuum of learning for your students.

Placemaking:

Take students outside to observe trees or shrubs in their schoolyard. Have them quietly observe the characteristics and parts of a tree or shrub. You can have them record these observations in their science journals either through writing or drawing (if they have one). Ask them to share their observations and discuss any similarities and differences. Introduce the term urban forest and engage in a discussion around what they think an urban forest is.

Anchoring phenomena:

Trees can grow in a lot of different places and in different ways.

Slideshow: Trees Never Give Up

Drawdown:

Indigenous Peoples’ Forest Tenure

Environmental Justice:

Tree Equity in America's Cities

Indigenous and other relevant cultural connections:

Trees have been culturally important to indigenous communities Since Time Immemorial. They honor and respect trees as teachers, as medicine, and as part of their communities. In this Storyline, we will learn how trees have been part of the traditions and lives of indigenous communities through storytelling and reading.

NGSS PEs (progress towards):

2-LS2-1 Plan and conduct an investigation to determine if plants need sunlight and water to grow.

K-2- ETS1-1 Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool.

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Estimated time required to implement this storyline: 2 weeks

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Science & Engineering Practice (SEP)	Disciplinary Core Idea (DCI)	Cross Cutting Concept (CCC)
Planning and Carrying Out Investigations Planning and carrying out investigations to answer questions or test solutions to problems in K-2 builds on prior experiences and progresses to simple investigations, based on fair tests, which provide data to support explanations or design solutions. ● Plan and conduct an investigation collaboratively to produce data to serve as the basis for evidence to answer a question. Ask Questions and Defining Problems Asking questions and defining problems in K-2 builds on prior experiences and progresses to simple descriptive questions. ● Ask questions based on observations to find more information about the natural and/or designed worlds. ● Define a simple problem that can be solved through the development of a new or improved object or tool.	LS2.A: Interdependent Relationships in Ecosystems ● Plants depend on water and light to grow ETS1.A: Defining and Delimiting Engineering Solutions ● A situation that people want to change or create can be approached as a problem to be solved through engineering. ● . Asking questions, making observations, and gathering information are helpful in thinking about problems. ● Before beginning to design a solution, it is important to clearly understand the problem.	Cause and Effect ● Events have causes that generate observable patterns. Structure and Function ● The shape and stability of structures of natural and designed objects are related to their functions.

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Materials:

Learning Session	Materials
1 Grounding Native Ways of Knowing	• Access to science journal or any paper for individuals to write down ideas, or complete on a class poster paper
2 Examples of Extreme Tree Growth	• Trees Never Give Up • KWL chart • Writing utensils
3 Pre-Assessment	• Class set of 2-Urban Forestry: The Needs of Trees Pre-Assessment • Rubric
4 What would happen without trees?	• Chart paper for collecting student ideas for the question: What would happen without trees? • Access to Can We Live Without Trees? • Class set of Thank You Trees Writing Paper.docx
5 What do trees need to survive?	Session 1 • Access to KWL Chart • Class set of Tree Parts Worksheet • Display Access to website Let’s Talk Science: Needs of Plants • Display Access to video What Do Plants Need to Grow • Poster or drawn on whiteboard Venn Diagram comparing Trees and Plants Session 2 • Access to individual Tree Parts Worksheet • Open space inside or outside • Small manipulatives that can be tossed around the room. For example, you can use blue Unifix cubes for water, yellow for sun, white for air.
6 What are the characteristics of a tree?	• Access to review parts of a tree pages or poster • Display access to Getting to Know Your Trees • Class set of Design Your Tree worksheet
7 What are different types of trees and how are their needs	• Class set of blank paper or access to science journals • Access to wooded area or area with at least two different types of trees on/around your school building or display access to Getting to

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different?	Know Your Trees • Access to what trees need to survive information: science journal, printed or class-created poster from session 5 • Student access to Trees of the Trail
8 Post Assessment	• Class set The Needs of Trees post assessment • Rubric link to final draft

Learning Sessions

1.	**Grounding Native Ways of Knowing: How have Indigenous communities in Washington traditionally connected with and maintained relationships with trees - from the past to current day?**	Estimated time: 60 minutes

To connect to native ways of knowing consider exploring the following ideas in connection with your local tribal nation by researching stories of the past and learning about current work and actions the Tribe is taking to mitigate, adapt to, and find solutions to a changing climate.

- Trees as Community
- Trees as Teachers
- Trees as Medicine
- Stewardship and management of forested areas
- Challenges and threats to forested areas

Below are stories that may be useful in connecting students to indigenous stories of trees. Choose one or two to share with your class.

- A Tale of Mice and ‘Fir’ Trees (*story is towards the end of the page)*
- When The Animals And Birds Were Created - A Makah Legend
- Grandmother Cedar

Below are some examples of regional tribal connections to forests and trees for teachers to gain background knowledge:

- Western Washington
  - Natural Resources | Forestry | Forestry Management
  - Muckleshoots buy huge forestland in 3 counties (Muckleshoot)
  - Two towering story poles blessed and welcomed on Puyallup land (Puyallup)
- Olympic Peninsula/Coast
  - The People of the Olympic Peninsula - Olympic National Park
  - Quinault Forestry Department | Quinault Division of Natural Resources (Quinault)
- Central and Eastern Washington
  - Logging project aims to restore forest, enhance recreation (Yakama)
  - Spokane City Council acknowledges Spokane Tribe as ancestral stewards of Spokane Falls, surrounding land (Spokane)

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	Suggested activity for teachers and students: 3-2-1 research process* **for younger students, this can be done as an anchor chart.* ● Three new learnings about the Tribe most local to you ● Two questions that you still have about the Tribe most local to you ● One action you can commit to begin a partnership with the Tribe most local to you Additional resources on working with Indigenous students and tribes: To access information on how to reach out and build relationships with local tribes, visit the OSPI Office of Native Education: Partnering with Tribes, and contact your district's tribal liaison/Title VI coordinator. To learn more about respecting and building upon Indigenous Peoples' Rights visit the Learning in Places website, a project led by Dr. Megan Bang then read Practice Brief #10: Teaching STEM In Ways that Respect and Build Upon Indigenous Peoples' Rights and Practice Brief #11: Implementing Meaningful STEM Education with Indigenous Students & Families published on the University of Washington's STEM Teaching Tools website.

2.	**Examine phenomena: Examples of Extreme Tree Growth**	Estimated time: 15 minutes
	Hook: Gather students and present the following riddle: I have rings, but have no fingers. I have bark, but cannot bite. I have a trunk, but am not an elephant. What am I? Activity: ● Position students to observe a slides presentation, Trees Never Give Up. ● Inform students that they will be observing pictures of trees. Their job as they are observing is to think about what they already know about trees and what they want to know about trees. Use the KWL chart as a reference. ● Complete the KWL chart during or after the slides presentation.	

3.	**Pre-Assessment:**	Estimated time: 20 minutes
	2-Urban Forestry: The Needs of Trees Pre-Assessment Pre-Assessment Rubric	

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4.	**Guiding question: What would happen without trees?**	Estimated time: 60 minutes
	Discussion (think, pair, share): Ask students what would happen to the Earth if there weren't any trees. Capture their ideas during the share out on an anchor chart. Show the video, Can We Live Without Trees? and ask students to listen for at least two ways trees help the Earth. *Ideas mentioned in the video:* *Produces oxygen, absorbs CO2, fights global warming, filters dust and makes the air healthier, supports other living things like bees, provides natural cooling effect, improves rainwater drainage, provides shelter from the wind, makes people happier and healthier.* With a partner, have them discuss what they heard from the video and share their learning to the whole group; add to the anchor chart as they share. Conclude the discussion by going back to the original question and adding any new thoughts/ideas. Make sure to emphasize just how important trees are to people, other animals, and the Earth as a whole. Next, have students write a "thank you" letter to trees for all their hard work and making our world a better place. Letter paper: Thank You Trees Writing Paper *Here is a website that has a 'basic parts of a letter' graphic if your students do not know how to write a letter.*	

5.	**Guiding question: What do trees need to survive?**	Estimated time: Two 40-50 minutes sessions
	Session 1 Review the KWL chart and add new information from the previous lesson. Introduce the word, **survive** (Present definition: Getting what you need to live) and picture cards of plants. Have students come up with examples of what plants need to survive. Lead the students in a discussion: Have you seen a tree grow? What do you think a tree needs to survive? Do you think a tree is a plant and do you think a tree will need the same things to grow as plants? Tell me about a tree you have observed. **Activity one:** Use the Tree Parts Worksheet to label the parts of the tree as a whole group. In this activity, students will be learning about the different needs of plants using a diagram from Let's Talk Science: Needs of Plants. There is additional information on the site.	

While displaying the diagram, locate and discuss the elements a plant needs to survive. Below are important ideas to share with students:

- Space: Ensuring there is enough room for the roots to grow
- Nutrients: Making connections to humans getting nutrients from our food to make us grow, be strong and healthy
- Water: Getting water through rain or from the ground using the roots
- Sunlight: Plants need different amounts of sunlight but they cannot survive without it
- Air: Plants get nutrients from the air.

Optional Activity 1b
Science Experiments for Learning about the Needs of Plants

Additional Information to support learning that will be presented when the teacher introduces the plant experiment.

- Nutrition: Where do plants get nutrients? Look at a sample of soil. What do you notice about the soil?
- Water: Two pots with plants or a simple vase with flowers. One vase will have water and the other will not have water.
- Sunlight: a small pot with a plant by the window and a small pot with a plant that does not get any sunlight.
- Space: Use a pot with two plants close together and one with only one plant.

Activity Two:
In this activity, students will add to their learning through information about the needs of trees.

Have students watch the video, What Do Plants Need to Grow. Inform students that they should be looking about for similarities and differences between trees and other plants.

Using a Venn Diagram created on a poster or a whiteboard, engage students in a discussion about trees versus other plants.

Session 2
Activity Three:
Each student will complete a Tree Parts Worksheet.

Begin with a discussion about what students remember about parts of the tree. Point out that a helpful tool will be the boxes located next to each part of the tree. Ask students what they think should be written in Box 1. Ask why and then talk about the leaves of the tree and why trees need their leaves. What is the function of the leaves? Possible answer: The leaves make the food the tree needs to survive using nutrients and sunlight (this is called photosynthesis).

Move to Box 2 and ask again what students think they should write in there. Begin a

discussion about branches and their purpose. Why are brunches important to the trees? Possible answer: branches bring nutrients to different parts of the tree.

Continue with Box 3 asking the same questions and leading the same discussion. Possible answer: trees need trunks for structural support, and they transport water and nutrients to the other parts of the tree. You can extend the discussion by telling students that the bark is to protect the trunks.

For Box 4 ask again what students should write. Why? Are roots important? What is their function? Possible answer: roots absorb and transport water and nutrients from the soil to the rest of the tree. They also help provide support to the tree.

Activity Four:
What Plants Need Game

Materials needed:
- Open space inside or outside
- Small manipulatives that can be tossed around the room. For example, you can use blue Unifix cubes for water, yellow for sun, white for air.

Inform students they will be playing a game to learn how trees get different amounts of nutrients, water, sunlight, air, and space.

Display small manipulatives and their assigned meaning: blue is water, white is air, etc.

Introduce the 'go words': trees rule or teacher's choice
Introduce the 'stop words': waterfall or teacher's choice

Directions for the game:
1. Inform students they must stay in place because they are grounded like trees. They can move arms and bend legs, but their feet must stay in place.
2. Teacher reviews the meaning of the different items.
3. Teacher spreads out manipulatives, but students cannot move until they hear the go words: trees rule.
4. Teacher says go words and students try to collect as many possible manipulatives as possible, while their feet stay grounded.
5. Once most items are picked up, the teacher says waterfall and the game stops.

Have students sit in place and review the manipulatives that were able to reach.
- What did they get a lot of? Why?
- What did they not get a lot of? Why?
- What connections to previous lessons can students make?

Trees grow in different places and we can extend the game by playing it for different locations. For example, trees in mountains, trees in country, trees by the beach, etc. each with a

	different number of manipulatives.

6.	**Guiding question: What are the characteristics of a tree?**	Estimated time: 60 minutes
	The goal of this lesson is to have students accurately describe characteristics of trees that help them survive and make them an important part of an ecosystem. We are referring to these characteristics as superpowers. Review the parts of trees using the worksheet page from the previous lesson. **Activity One**: Presenting Information Position students to view the presentation Getting to Know your Trees. Students will be asked to work in partners or groups. Each tree introduced starts with a discussion of what habitat in which you would find the tree. This will be done as a Think, Pair, Share activity. ● For the first slide, review the habitats displayed and model using the sentence frame for answers. ● After prompting students, “Where would you find this tree?”, give think-time to the whole group. Then have students share, in pairs or to their group, their answers ● Have volunteers or group representatives share their ideas with the whole group. Trees introduced have their own information card. These are presented and then used to check if predictions make sense. Example: Our prediction about mangrove trees was correct, because we thought the mangrove tree would live in the wetlands habitat. **Activity Two:** Synthesizing Information Review with students that each of the trees presented had their own superpowers. Inform students they will get to design their own tree using the information they learned from the presentation. Introduce the design worksheet with instructions: ● Design your tree using different parts from the trees we learned about ● Label the different parts of your tree using the word bank to help ● Describe your tree and its superpowers on the sentence frames below Lesson Wrap Up: Allow time for students to share their designs with partners or as a whole group. This is a great opportunity for students to practice using the tree parts anatomy and descriptive language. Observe students’ ability to accurately describe characteristics of a tree that help it survive and make it an important part of an ecosystem.	

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7.	**Guiding question: What are different types of trees and how are their needs different?**	Estimated time: 60 minutes

Have students spend a minute thinking of a tree they know well or have seen recently - this can be a tree at their home, school, or in their neighborhood. Have them spend five minutes drawing a picture of the tree in their science notebooks/journals. If students finish early, have them label their trees and ask them to think about the shape of the leaves from the tree, the bark, the height, and the shape of its branches.

Once the five minutes is up, have students share their pictures and what they remembered about their trees. Create a chart of the characteristics of the trees students share; leaves, shape of branches/tree canopy, bark, fruit, nuts, seeds, height, or anything else they think of. Try and pull out the differences students describe through using questions such as:

1. Does your tree have needles or leaves?
2. Does it lose its leaves in the winter?
3. What size are the leaves? Are they big or small?
4. Does your tree have flowers, nuts, or cones?

Two Options for the remainder of this learning session:

A. Go outside to a wooded area or area with at least two different types of trees on/around your school building. You can also take a field trip to a local park (if manageable).
B. Stay inside to complete this learning session using the Getting to Know Trees slideshow.

Ask students if they know how to tell one kind of tree from another and have them share their thoughts. Explain the different parts of a tree and how those parts (needles, leaves, and bark) can all vary from one tree to the next. Have them review what trees need to survive and explain that just like other living things, such as animals, trees live in different types of places (habitats) and need different amounts of light, water, soil and space to live and stay healthy.

Break the students up into pairs or small groups and use the science journal pages to observe a single tree. Make sure they take notes on every detail they can find and draw a picture of their tree in the journal. Have them compare their tree to another tree, noting the way the trees are similar and different. Have them use the following site to see if they can identify their tree. Trees of the Trail (wta.org) *They may not as some trees are used for ornamental purposes and are not listed on the graphic.*

Go back and look at the different trees from around the world and pick two trees from different locations to compare and contrast to the students' trees. How does the type of tree and the location of that tree differ? In terms of light, water, soil and space, compare and contrast which needs more or less of each.

8.	**Post Assessment:**	Estimated time: 30 minutes

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	The Needs of Trees post assessment Rubric

9.	**Possible next steps/off-ramps/actions and career connections**	
	Career Connections: Arborist Meet an Arborist Urban Forester What is Urban Forestry? Land Steward Addie Schlussel Assistant Forester Ciara Fenimore Forest Engineer Wendi Lubinus Resource Forester Katherine MacDonald Toad Abode Field Investigation Talking Trees Lesson Plan Tree Detective Lesson Plan	

Teacher Resources

OER Tracker

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