Other Names: Salix species. Salix is derived from the Celtic "sal" for near, and "lis" for water. Twana: TS3bTSa’baxWaqsii (Pacific willow), q21?i’tSay (pussy willow), Lushootseed: cəx̕əluʔ.

Identifying Willow: Willows have a worldwide presence, with over 300 species growing in a diversity of habitats on every continent except Australia and Antarctica. There are over 35 species in the Pacific Northwest, often growing along the edges of rivers, ponds, wetlands, or beaches. Most willows are bushy with many stems, but a few are larger, multi-trunked trees. They are easy to miss until very early spring when new growth paints bright green, yellow, and reddish hues on the monotonous winter landscape.

Willows are notoriously difficult to identify. There can be significant variations within a single species, and different species can hybridize to create new varieties. Winter and early spring shoots are often straight yet flexible, and buds grow in an alternative formation on stems. They hug the stem versus jutting out, making the stem appear very straight. Each bud is covered in a single protective cap or scale that falls off soon after the bud opens. Willow leaves are simple shaped with smooth or finely toothed edges. The flowers are arranged in catkin-like clusters called aments, which often appear before or at the same time as the leaves. Willow aments point up versus the drooping aments of poplar, hazelnut, and alder. Male and female flowers grow on separate plants. Tiny female flowers usually emerge from downy cotton, hence the common name “pussy willow.” Pollen on male flowers often has a bright yellow hue that attracts insect pollinators. Once the female flowers are pollinated, they swell into seeds and take flight as their downy tuft is pulled by the wind. Seeds root in open, wet soil, and thrive in the wake of disturbances including floods, slides, and fires.

Four common varieties in the Pacific Northwest include:
- **Hooker’s Willow** – Salix hookeriana (aka Piper’s willow: S. piperi). Shrub or small, multi-trunked tree. Twigs are stout, grey, and hairy. Upper sides of leaves are hairy (sometimes nearly smooth) and egg-shaped. The undersides of the leaves are covered with white-to-rust colored hairs. Unopened flowers are “pussy willows” and come out before the leaves. It grows in moist, swampy areas from the coast to mid-elevation.
• **Pacific Willow** – *Salix lasiandra*. Tree with a single trunk. Twigs are glossy. New growth is yellow, while older branches are brownish-grey. Leaves are lance shaped and pointed at the tip with fine serrations along the margins, and two or more glands where the petiole (leaf stem) attaches to the leaf. Young leaves are hairy and then become smooth with a whitish bloom beneath. Pacific willow is common in wet areas from the coast to mid-elevation. It grows to 50 feet.

• **Scouler’s Willow** – *Salix scouleriana*. Shrub or small to medium multi-trunked tree. Twigs are densely velvety, while larger branches are dark brown and hairless. Leaves are round and widest at the tip, tapering to a narrow base. Older leaves are dark green and hairless above, but hairy and rust or silver-colored beneath. Scouler’s willow grows up to 40 feet and usually has multiple stems. Unlike other Northwest willows, it will grow in dry areas at a distance from water.

• **Sitka Willow** – *Salix sitchensis*. Shrub or small, multi-trunked tree. Branches are dark brown to grey and twigs are densely velvety and brittle at the base. The leaves are wider at the tip, smooth and bright green above, and hairy to woolly underneath. Aments are long and slender.

**Where It Grows:** Willow generally grows along the edges of rivers, ponds, wetlands, or beaches.

**Season:** Bark and small branches are harvested for medicine in early spring or fall. Leaves can be gathered in spring through late summer. Bark is harvested for fiber from spring to early summer when the sap is running.

**How to Harvest:** While all willows are medicinal, the medicine’s strength can vary depending on species and where the plants grow. Be sure to harvest willow in an uncontaminated area. The most medicinal willows smell like wintergreen and taste bitter like an aspirin tablet with a tart vitamin C aftertaste. This is what you want. Once you find a tree with these characteristics, you can go back to harvest year after year. It is useful to develop a relationship with a specific place and monitor its health over the years due to both foraging and changes in the environment.

Willow bark and the small branches are the most potent part of the plant. If you harvest from a large willow tree, cut the newer branches, then peel the bark and large twigs with a knife. Small twigs can be easily cut with garden scissors or clippers. Pick willow leaves off branches and dry in baskets or paper bags.

**Eating Willow:** All willows are edible, but some are not palatable. The leaves are high in vitamin C – seven to 10 times higher than oranges! The inner bark was traditionally eaten by many Native Peoples in Alaska, Montana, Utah, and California, although it labor intensive that very few people continue the practice today. Willow bark is high in calcium, magnesium, zinc, and other trace elements.

**Medicine:** Willow has been valued as an anti-inflammatory, pain reliever, fever reducer, and bitter tonic for thousands of years. Its use was documented in 4,000-
year-old tablets from ancient Sumeria, and it was perhaps the most important of 700 medicines mentioned in the Ebers Papyrus from Egypt in 1534 BCE. It has maintained mythic status in China, Europe, and the Americas for countless generations.

In the early 1800’s chemists extracted the main active substance in willow, called Salicin. Later, in the mid 1800’s, an artificial method of creating salicylic acid was found, making it cheap and easy to create pain-relieving and fever-reducing medicine without willow. In the 1890’s, the Bayer Company released the drug Aspirin, which has risen to become the most utilized medicine in the world. The medicinal value of willow has seemingly withered away in the wake of cheap and accessible synthetic drugs. Yet, it still holds a rightful place in our medicine cabinets.

Willow contains plant compounds including populin and methyl salicylates. Populin is also found in cottonwood and contributes to both trees’ anti-inflammatory and fever reducing medicine. Methyl salicylates have a minty or wintergreen smell, and can be found in varying concentrations from one willow to another. Willow can help ease headaches, arthritis, muscular pain, cramps, swelling, flu-like symptoms, fever, and irritability of the urethra and bladder. Like Aspirin, willow helps to prevent blood coagulation and assists in keeping the waterways of blood flowing smoothly throughout the body.

Willow is an excellent first aid remedy that is often available in the wilderness. It contains vitamin C, which helps to heal tissue, and tannins, which have astringent properties that reduce swelling and bleeding. It also acts as an antimicrobial and a pain reliever. Try willow for treating stings, painful swellings, cuts, burns, and other injuries. You can make a poultice by mashing up the bark or leaves, or you can make a strong tea and place it over an injury. The tincture can be used topically too, as long as there is not an open wound as alcohol inhibits skin healing.

Willow is prepared in several ways. For tea, the bark is generally boiled. The leaves are also prepared as a tea and are infused for about 15 minutes in hot water. Because willow tea tastes so bitter, many people prefer to take it as an alcohol tincture. The fresh bark can be finely chopped and then gently heated in olive oil to make topical massage oil or a salve. Willow bark or leaves are also made into a tea and used for baths or foot soaks.

CAUTION: Those taking anticoagulant drugs should not use willow internally. While it is better tolerated than Aspirin for people with stomachaches and ulcers, it should not be used if you have a salicylic acid allergy.

**Traditional Technologies:** Many Native People throughout the Pacific Northwest have made cordage from the inner bark of willow. It is gathered in spring, pulled apart, and then twisted to make rope for fishing lines and nets. Willow poles were used as fishing weirs because they are strong and flexible, do not rot when submerged in water, and root where they are planted. Willow can also be used to make bows and arrows.

**Baskets** fashioned from many types of willow stems are found throughout the world.

**Ecological Relationships:** Willow is important to watery ecosystems because it stabilizes stream banks and provides shade over the water. This helps to keep the water cool and clear so salmon and other species can thrive. Deer, elk, and moose enthusiastically graze on willow as a food source, and beavers use it for building material. Willow flowers produce vast amounts of pollen and nectar that bees and other insects rely on.
Resources
Northwest Trees and Arno and Hammerly
Living Willow Sculpture by Jon Warnes
Willow: A Guide to Growing and Harvesting plus 20 Beautiful Woven Projects by Jenny Crisp

References
Moore, M. Medicinal Plants of the Mountain West. Museum of New Mexico Press. 2003
http://agresearchmag.ars.usda.gov/2003/dec/plant/
Overview: Many types of willows have straight, flexible shoots in late winter through spring. These can easily be made into a sculpture or a living structure. In this activity, students work together to design a structure, and then collaboratively build it.

Student Wondering: What does the flexibility of willow allow us to build?

Learning Objectives

<table>
<thead>
<tr>
<th>Understandings</th>
<th>Knowledge and Skills</th>
</tr>
</thead>
<tbody>
<tr>
<td>Student will understand that…</td>
<td>Student will be able to…</td>
</tr>
<tr>
<td>• willow’s physical qualities including flexibility help it to survive in its environment.</td>
<td>• identify one type of willow and understand its life cycle.</td>
</tr>
<tr>
<td>• People use willow to build materials and structures.</td>
<td>• work in collaboration to design and build a willow structure.</td>
</tr>
<tr>
<td>• connect spatial arrangement with human function.</td>
<td>• connect spatial arrangement with human function.</td>
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</tbody>
</table>

NGS Standards: Performance Expectations

- 3-LS1-1. Develop models to describe that organisms have unique and diverse life cycles but all have in common birth, growth, reproduction, and death.

Scientific and Engineering Practices | Disciplinary Core Ideas | Crosscutting Concepts |
--- | --- | --- |
• Developing and Using Models | • LS1.B: Growth and Development of Organisms | • Patterns |

Vocabulary: flexibility, strength, adaptable

Background: There are many types of willow in our region. They are not easy to notice until spring when they produce prolific shoots. Some are bright colors including yellow Pacific willow. Most are flexible, long, and straight, and can easily be used for building baskets, small structures, and other materials. Willow’s flexibility and strength help it to survive in an ever-changing landscape where harsh weather and floodwaters may put extreme pressure on plants.
Willow has a rooting hormone and will easily root in the ground from cuttings. A single branch from willow can float down river and take root in a muddy bank. If it is appropriate, students can build a living structure that will develop leaves and grow into willow trees.

Willow is a model of strength paired with flexibility, and this teaching can be applied to students' social and emotional skills.

**Materials:**
- A sufficient number of willow shoots to build the planned structure
- Strong garden shears or pruners
- Strong twine or willow cordage you make (see willow cordage lesson)
- A shovel (if you will be burying the shoots)
- A camera for documentation
- Samples of other building materials with different qualities like hollow bamboo, a strong cedar or fir board, etc.

**Preparation:** While some schoolyards have willow trees, most teachers will need to procure long shoots from another location. This can be tricky without a nearby wetland and a truck. You may have luck calling a local arborist or landscaper to see if they can donate willow cuttings and deliver them to the school. City foresters and water education centers may have access to land with willow shoots and be willing to donate materials for school activities. Willow shoots should be used within a few days of cutting. If they sit for too long, they will harden and you may need to soak them in water overnight.

**LESSON: WILLOW SCULPTURE**

**INTRO** 10 MINUTES

Begin by passing out samples of willow cuttings so each student or groups of students can take a close look.

**Ask:** What do you notice about this plant? Do you know what it is? How do you know? Give students a chance to respond.

**Share:** Willow is flexible, yet strong. Notice how branches bend and withstand a lot of movement before they break. (Show examples of a few flexible versus inflexible plant shoots including bamboo, cedar, fir, etc).

**Optional:** Think, Pair, Share – Have students discuss how plant physical traits like flexibility or shear strength help them to survive in their environment. How do people utilize these plants to build their own materials and structures? (Answers might include that willow is used to make baskets and sweat lodges where you need strong flexible shoots. Bamboo is lightweight yet strong and is used for fences, flooring, etc. Cedar, fir and other woods are strong and inflexible, and are used for straight building materials.)

Willow Overview: Choose information that is appropriate for your students knowledge level. For example:
• **Identification**: If you have a willow shoot with the “pussy willows,” explain that they are flower buds. Point out features such as the single cap over the unopened buds, how the buds hug the twig and make it look very straight, and that the buds are oriented in an alternating fashion on the branch.

• **Where it Grows**: Willow thrives in the ever-changing landscapes near water including wetlands, riparian zones, and beaches.

• **Ecological Relationships**: Willow provides important shade, shelter, and food for many types of animals. It helps to keep the water cool so salmon and other water creatures can survive. In cases of flood or landslide, willow branches can help to stabilize the landscape by rooting directly into the disturbed soil and growing into new plants.

• **Willow is Flexible, Strong and Adaptable**: These characteristics allow it to thrive in a changing environment. These qualities make it possible for our class to create a willow sculpture!

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### PLANNING DISCUSSION

10 MINUTES

Lead a group discussion about what type of structure students will build. They will have to think about many factors including:

- **Function**: Will the structure be a piece of art that people look at, or will it be a shelter that people can enter. They could build a living willow den, a giant nest or an archway.

- **Location**: Where will the sculpture be placed? What size will work in the location?

- **Strength and Durability**: Recall the story of the three little pigs. How will the class build something that will stay strong? Good structural design requires planning. For example, how many willow shoots will you need, and how will you securely bind or weave them together?

- **Lifespan**: If the class is building a living structure, how long can it continue to grow there? A non-rooted sculpture will naturally decompose over time.

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### HANDS-ON ACTIVITY

30 MINUTES TO SEVERAL HOURS

**Harvest**: If you have willow trees on the school campus, you can show students how to safely harvest willow shoots. Introduce harvest ethics including not taking too much from any one plant so it can continue to thrive. If appropriate, introduce ways that people honor plants before they harvest. Gather shoots for your planned sculpture.

**Build**: Before you begin building, ask students what they think would be important to remember around safety protocols including not throwing, jabbing, or getting the willow sticks near other students’ faces. You may need to assist younger students and have them work one or two at a time. For example, if you are building a willow den, you can measure a circle including where holes will be, and each student can dig a hole, place their branch in the hole and bury it. Once the tops of the branches are tied together, students can work together to weave branches horizontally through the upward branches. You can also weave yarn, ribbon or strips of fabric through the willow den.
TYING IT TOGETHER

10 MINUTES

**Group Discussion:** **Ask:** What worked and what didn’t work? What vision do you have for the willow sculpture?
Give students time to share their reflections.

**Think, Pair, Share:** Have students work with a partner or a small group, then give time for whole group reflection. **Ask:** Share an experience where being flexible helped you to get through a difficult situation.

DIGGING DEEPER

**Photo Book:** Document your process from start to finish. Include pictures and any stories that might capture students’ experiences with willow.

**Mapping Project:** If you are building an outdoor willow play structure you could do a mapping project with the group. Measure the area you are working in and draw what is there. Think about how people move through the landscape and where the most optimal placement might be.

**Pruning Skills:** Cutting shoots of willows and many types of fruit trees can help new shoots to grow. This is called coppicing. Ask an arborist to talk about spring tree pruning and how it helps plants to grow better. Kat Anderson’s book *Tending the Wild* outlines how natural resource management can have a positive influence on landscape and help us encourage desired traits in certain plants, such as straight shoots from willow.

**Write a Willow Story:** This may include the willow plant, animals, people, and forces of nature. Willow characteristics of flexibility, strength, adaptability, and resilience may be included. You can include your willow structure in the story.

**Make Willow Cordage:** As a class, you could create your own willow cordage to bind your structure. See the willow cordage activity for tips.

**Willow Structure Ribbon Cutting or Grand Opening:** Have an open house for your structure or include it in a gallery walk.

*This activity is adapted from the book *The Barefoot Book of Earth Tales* by Dawn Casey.*
WILLLOW WATER PLANT PROPAGATION

Time: 30-45 minutes (plus 4-6 weeks for final results).
Season: Late Winter through Summer
Age: Grades 4–12
Setting: Indoor, or outdoor greenhouse

Overview: This lesson introduces willows including how they reproduce and their ability to stimulate root growth. Students prepare plant cuttings that are treated with willow and a control group with water. Through monitoring roots over several weeks, students determine how effective willow is at stimulating root growth.

Student Wondering: How does the natural rooting hormone in willow affect root growth in plants?

Learning Objectives

<table>
<thead>
<tr>
<th>Understandings</th>
<th>Knowledge and Skills</th>
</tr>
</thead>
<tbody>
<tr>
<td>Student will understand that…</td>
<td>Student will be able to…</td>
</tr>
<tr>
<td>• willow cuttings can create new roots to become a new plant, and can also help other plants grow.</td>
<td>• design, conduct, and monitor a controlled research experiment.</td>
</tr>
<tr>
<td></td>
<td>• compare root growth in plants treated with willow cuttings (or willow tea) to untreated plants over time.</td>
</tr>
</tbody>
</table>

NGS Standards: Performance Expectations

• 4-LS1-1. Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.

<table>
<thead>
<tr>
<th>Scientific and Engineering Practices</th>
<th>Disciplinary Core Ideas</th>
<th>Crosscutting Concepts</th>
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</thead>
<tbody>
<tr>
<td>• Engaging in Argument from Evidence</td>
<td>• LS1.A: Structure and Function</td>
<td>• Systems and System Models</td>
</tr>
</tbody>
</table>

Vocabulary: catkin, ament, dioaceous, monoaceous, botanist

Background: Willow contains a natural rooting hormone called indolebutyric acid that stimulates root growth. This compound is highest in the growing tips. If a branch breaks off a willow plant and travels downstream, it will easily root in a muddy bank. Gardeners have utilized willow to help other plants root for centuries.

Materials:
• Willow shoot cuttings or willow twig tea
• Clear vases or clear planter pots
• Several cuttings of a plant that will easily root, like mint or begonia

**Preparation:** Teachers can choose to root plant cuttings in water with willow twigs or in soil by watering the starts with willow tea. Test a minimum of three to four containers with willow and the same number with water as a control group. If you are rooting in water, you will need clear vases or glasses with narrow tops. If you are rooting in soil, you will need clear plastic containers with holes on the bottom so students can observe root growth. Gather several test plant cuttings from the same plant that are as similar as possible.

**LESSON: WILLOW WATER PLANT PROPAGATION**

<table>
<thead>
<tr>
<th>INTRODUCTION</th>
<th>10 MINUTES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Begin with an overview of willows including where they grow, botanical characteristics, and ecological relationships. For example:</td>
<td></td>
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<tr>
<td>• Willows are common along the edges of rivers, ponds, wetlands, and beaches.</td>
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<tr>
<td>• Most willows are bushy with many stems, but a few varieties are larger, multi-trunked trees. They are easy to miss until very early spring when new growth is brightly colored. You might also recognize pussy willows when the flowers are fuzzy. Not all willow flowers are soft and downy, but they all have similar shapes that are commonly called <strong>catkins</strong> or <strong>aments</strong>. Willow aments point upward, while hazelnut, cottonwood, and alder aments point downward.</td>
<td></td>
</tr>
<tr>
<td>• Willows are important guardians to wetlands, ponds, streams, and rivers because they stabilize banks and provide shade over the water. This helps to keep the water cool and clear so salmon and other species can thrive. Deer, elk, and moose enthusiastically graze on willow as a food source, and beavers use it for building material. Willow flowers produce vast amounts of pollen and nectar that bees and other insects rely on.</td>
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</table>

**Ask:** *How do you think willows spread to new areas?* Give students time to respond.

**Share:** Willows reproduce through sexual reproduction. Male and female flowers grow on different plants, and the male pollen is carried to female flowers by wind. The botanical term for this trait is **dioecious**.

**Monoecious** is a term that describes plants that have male and female flowers on the same plant. Noticing this difference can help **botanists** to identify plants. Once willow’s female flowers are pollinated, they turn into small seeds that are covered in a soft white down that is so light it can be carried on the wind. They sprout easily in open disturbed soil like riverbanks or muddy wetlands.

Willows can reproduce another way. If a willow branch breaks off a plant and travels downstream, it will readily root in a muddy bank. If there is a flood or landslide, willow can easily re-establish itself in a new location.

**Ask:** *How do you think this happens?* Give students a chance to respond. Share that willow contains a natural rooting hormone called indolebutyric acid that stimulates root growth. It is highest in the growing tips.
WILLOW EXPERIMENT

Share: We are going to conduct an experiment to see if willow helps plant cuttings (from mint, begonia, or another plant of your choice) to root better. You will document the root growth of cuttings with a ruler and record the findings on graph paper. In order to get accurate results, you will treat three to four very similar cuttings with willow, and an additional three to four cuttings with regular water as your control group. This will help you determine if the willow treatment stimulates additional root growth.

Ask: How can we get the most accurate results? Student answers might include exposing all of the plants to the same amount of light and water.

Share: There is another benefit to treating new plants with willow. According to recent research, the salicylic acid present in willow branches is involved in a plant’s systemic acquired resistance. When a part of a plant is attacked by disease or insects, it increases salicylic acid production and thereby raises its natural defenses throughout the plant. Plants can even convert salicylic acid into a volatile compound that can warn other nearby plants. When you use willow water on tender new cuttings, you may be helping them to defend themselves. It is interesting to note that people have taken plant medicines that contain salicylic acid for many thousands of years to reduce pain and inflammation and lower a fever.

Prepare samples and establish guidelines for regular watering and monitoring of root growth. Looking at the roots once a week for four to six weeks should produce measurable results.

TYING IT TOGETHER

Group Discussion: Ask: Why do you think willow produce its own rooting hormone? Give students a chance to share their thoughts. Remind them that willow is accustomed to growing in places where there is a lot of change. Rivers, wetlands, and beaches are constantly shifting due to the forces of water. Willow both thrives in these places, and helps to keep the landscape diverse through providing shade over the water, soil stability, habitat for birds, and food for grazing animals.

Documentation and Final Result: Make a chart and document results over the next 4-6 weeks. Which plants rooted fastest? Which plant roots are the largest?

DIGGING DEEPER

Willow Controlled Research:
- Explain the concept of double blind placebo studies to students.
- For longer experiments, measure pre and post weight of plant cuttings.
- Complete a research project on the use of willow in riparian zone restoration. Why is it used so frequently?
Overview: In this multi-day lesson, students learn how to prepare willow as a medicine. In the first activity, they strip willow bark from branches and create infused oil. After at least three days, this oil can be used to make a pain-relieving salve.

Student Wondering: How does willow bark help people to be more flexible and free from pain?

Learning Objectives

<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td>Student will understand that…</td>
<td>Student will be able to…</td>
</tr>
<tr>
<td>• willow grows in wet areas and has physical characteristics including strength and flexibility.</td>
<td>• identify an adult willow tree.</td>
</tr>
<tr>
<td>• willow has healing properties and can be used for medicine.</td>
<td>• explain why willow is called &quot;Nature’s aspirin&quot;.</td>
</tr>
<tr>
<td></td>
<td>• harvest and make oil from willow bark.</td>
</tr>
</tbody>
</table>

NGS Standards: Performance Expectations

• 4-LS1-1. Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.

Scientific and Engineering Practices | Disciplinary Core Ideas | Crosscutting Concepts
---|---|---
• Engaging in Argument from Evidence | • LS1.A: Structure and Function | • Systems and System Models

Vocabulary: flexibility, tannins, cordage

Background: Willow bark is called “nature's aspirin” and has many topical and internal applications including relieving pain, inflammation, and high fever. Although it has largely been replaced by inexpensive drugs like Aspirin, willow is still an excellent medicine that can be prepared as a tea, tincture, poultice, and oil.

Materials:
Class 1: Fresh willow branches, knives, garden scissors or sharp clippers, bowls, extra virgin olive oil, double boiler, glass jar with lid for storing oil, label
Class 2: Willow oil, beeswax, essential oils (rosemary and peppermint or birch), double boiler, measuring cup, scale, stovetop or portable burner, salve containers so each student can have a sample (glass jars, tins or large lip balm tubes), labels that include ingredients plus the date and use such as “use topically for pain and inflammation”

Optional: Combine willow oil with other pain-relieving oils including arnica, cayenne, cottonwood, Devil’s club, or St. John’s wort

Preparation: Read the Willow Overview. Gather enough willow branches to make oil. Harvest no more than two days before the class or they will dry out and stripping the bark will be difficult. Removing the bark from the hard inner wood is easy with a knife, especially in late spring to early summer. If you are worried about students using knives, cut a single strip down the length of the branch and have students peel the bark off. If the branches get too small to strip the bark, finely cut them with scissors or clippers. You should need about two cups of finely chopped bark and four cups of olive oil. This will make about 40 1oz. salve containers. You can also pour the salve into large lip balm tubes for applying directly to sore muscles.

LESSON: WILLOW MEDICINE

INTRODUCTION

The Art of Noticing: Pass around willow branches for students to see, smell, and touch. Encourage them to notice the flexibility. They can separate the strong inner wood and the bark. If it is early spring, encourage them to notice how the buds are covered in a cap. Some questions you might pose include: Are the buds and leaves opposite or alternately arranged on the stem? Are the leaves serrated or smooth? Are leaves a different color and texture on the top and bottom?

Ask: Does anyone know where willow grows? How do you know it is a willow? Give students a chance to respond. Fill in information that is appropriate for your students.

Share: Notice how willow branches bend easily and can be made into baskets, hoops, and cordage. Willow is a plant that teaches us about flexibility. Because it is so flexible, it is made into baskets, hoops, and cordage all over the world. It is used as a medicine both internally and topically to ease pain and inflammation. Here are some of the ways that it works:

- Willow bark contains plant compounds called tannins, which tighten inflamed membranes and reduce bleeding. These compounds are found in many plants including black tea, oak bark, and rose.
- Willow contains the plant compounds populin and methyl salicylate. Populin is also found in cottonwood, and contributes to its anti-inflammatory and fever-reducing medicine. Methyl salicylates have a minty or wintergreen smell and can be found in higher concentrations in some willows. They feel cooling to hot, painful injuries, and are anti-inflammatory.
- Willow contains vitamin C, which helps to heal wounds.
- Willow has antimicrobial properties.
These attributes make willow a top-notch first aid remedy. It is almost always available when you are in the wilderness. Think of using willow to treat stings, painful swellings, sore muscles, arthritic joints, cuts, burns, and other injuries. You can make a poultice by mashing up the bark or leaves, or you can soak a cloth or towel in strong willow tea and place it over an injury.

**HANDS-ON ACTIVITY**

**Share:** Willow bark and the small branches are the most potent part of the plant. They are strongest in spring or fall, but can be gathered any time of year. If you are harvesting from a large willow tree, cut the newer branches then peel the bark and large twigs with a knife. Small twigs can be easily cut with garden scissors or clippers.

**Make Willow Oil:** Have students strip larger bark and cut small stems into small pieces. They can use knives, clippers, scissors, and even their hands to remove the bark. Once finished, place the bark in a double boiler. Cover completely with extra virgin olive oil or another oil of your choice and heat very gently for several days, turning the oil on and off so that it does not boil. If you complete the oil at home, make sure to press it out with the class so they can see the whole process.

**Optional:** Have students make a willow poultice by mashing up leaves or bark and placing it over a wound.

**TYING IT TOGETHER**

**Share:** Willow will give up its medicine to the oil. Gentle heating the oil over several days will help to remove the water from the plant material and to increase extraction. In another class, we will press out our oil. This can be used straight for pain relief, or it can be made into a salve by adding beeswax.

**Class Discussion:** (Think, Pair, Share with a partner or a small group, or have each student share). **Ask:** Willow teaches us about flexibility. **What helps your body to be flexible? What helps your mind to be flexible?**

**PART 2 - WILLOW PAIN-RELEIVING SALVE**

**INTRODUCTION**

**Ask:** **What do you remember about willow medicine?** Give students a chance to respond.

**Share:** Fill in knowledge from the *Willow Overview*. Explain that you will be pressing out willow oil and turning it into a salve with the addition of beeswax and essential oils. Beeswax stabilizes the oil so that it will stay on the skin longer. It also increases the shelf life of the oil.

**HANDS-ON ACTIVITY**

Demonstrate how to press out willow oil using muslin cloth or another type of clean cotton cloth. Students who have washed their hands can take turns pressing the oil.
Begin heating a double boiler on a burner. Place jars, lids, essential oils, and labels on a table or counter. Work with students to figure out the amount of beeswax and oil you need to fill the jars. The proportions for a standard salve are one-part beeswax by weight to five-parts oil by volume. For example, if you have two ounces of beeswax that you measure on a scale, you will pour 10 ounces of oil into a measuring cup. You can use willow oil on its own, or you can combine it with other pain relieving oils like cottonwood, arnica, St. John’s wort or Devil’s club. Gently heat the oil and beeswax in a double boiler until it is just melted. Test the consistency of the salve by dropping a few drops onto a metal spoon or lid and allowing it to cool. If it is too thin, add more beeswax. If it is too thick, add more oil.

Create a salve-making production line. Have one student pour the salve into 1oz jars and pass it to a student who drops two drops of rosemary essential oil per ounce in each jar, a student who drops two drops of peppermint or birch essential oil in each jar, a student who stirs the salve with a small stick or toothpick, and a student who places the lid on the salve. Once the salve has set, students can put labels on the jars. Give one finished salve to each student. Remind them that salve is only for topical use.

**TYING IT TOGETHER**

5 MINUTES

**Share:** What we have done today is a basic method for making oil and salve. The Egyptians were preparing similar willow medicine thousands of years ago! People around the world use willow in the same way. This method of making oil and salve can be applied to many other plants. Examples might include a healing salve with plantain and yarrow, a rose lip balm, or a cedar chest rub for coughs.

**Closing:** Have each student share something that they will remember about willow.

**DIGGING DEEPER**

**Willow Research Project:** This might include the history of willow medicine around the world, how salicylic acid was originally derived from willow bark, or documenting local stories about how willow is used for medicine.