

# ALDER

*Alder builds strong community. Seeds fly in the wind and rain down on disturbed soils in the wake of fire, landslides, or clear cuts. As trees grow, they enrich the soil and provide a shady habitat for many species to live. Alder medicine helps reestablish harmony in our bodies through fighting infection, healing inflamed tissue, and promoting a healthy transfer of nutrients.*



**Other Names:** *Alnus rubra*, 13wa'qay (Twana), səkwəbac (Lushootseed), sqwúŋəč (Klallam)

**Identifying Alder:** Red Alder is a common deciduous tree that grows up to 30 meters, or 100 feet tall. Young trees have smooth silvery bark. Older tree bark is often patched with white lichen, moss, and dark spots. The inner bark and wood turn deep orange when cut. Leaves are serrated, sharply pointed at both the tip and base, and curl slightly under. They are smooth and dull green on top, slightly hairy underneath, and grow in an



alternate orientation on stems. In early spring, male catkins hang from leafless branches like fancy tassels and give the treetops a reddish flush. This is a sure sign that spring is just around the corner. Female catkins grow on the same tree. They are 1/2–3/4 inches in diameter and resemble pinecones that mature from bright green to woody brown. They contain tiny fruit (winged nutlets) that are built for wind travel. Both male and female catkins take a full year to develop. Alder is in the Betulaceae (birch) family.

**Where it Grows:** Red alder grows along the Pacific Coast from southeast Alaska to central California, forming lush thickets in wet places along streams, rivers, wetlands, and recently cleared land. It is an early forest succession species that takes root in the wake of glaciers, slides, fires, and clear-cuts. All types of alder in the Pacific Northwest are used for medicine. Sitka alder is a shrubby small tree growing in the mountains while thin leaf alder prefers dry habitats east of the Cascade Mountains.

**Season:** Alder leaf buds are harvested in February or March before the leaves emerge. Female catkins can be harvested in the spring through summer when they are fully mature, but not yet brown and woody. Male catkins can be harvested when they are very small in spring through the following winter before they turn red and release pollen. Leaves are harvested anytime from spring to summer. The bark and twigs are most potent in the spring and fall when sap is flowing.

**How to Harvest:** For leaf buds, look for recently fallen trees or branches, or trees that have low hanging branches. Mature leaves are simply pulled off the stem when they are still vibrant green. Immature male catkins and female cones are easy to pinch off of branches. If you are harvesting bark from the trunk, only take a narrow



strip about the width of your hand so the tree continues to thrive. Separate the red inner bark from the tough outer bark. The inner bark offers the strongest medicine and the outer bark can be composted. You do not need to separate inner and outer bark from the smaller branches or twigs because the bark is so thin.

**Eating Alder:** Alder catkins are high in protein and are used as a survival food. Some indigenous people in the Pacific Northwest ate the inner bark of alder in springtime.

**Medicine:** Once considered a “trash tree” to the Forest Service, alder is underappreciated and underutilized. Alder tree communities take root in decimated places and reestablish harmony and richness in the landscape. Alder does this for human health as well by soothing inflammation, fighting infection, and promoting healing. The bark is most commonly used, but the leaf buds, mature leaves, and male and female catkins are also medicinal.

Alder is bitter and supports liver functions, such as the breakdown of wastes and formation of bile to assist with fat digestion. A tincture made from alder can help ease indigestion after a fatty meal. Alder is also antimicrobial and is used to treat internal and topical infections. Its astringent properties make it useful in tightening inflamed tissue. Skokomish elder Bruce Miller recommended alder bark tea for mouth ulcerations and sore throats. Skin disorders including acne and boils may respond well to both internal and topical use of alder. The leaves, catkins, and bark can be made into a bath, poultice, compress, decoction, oil infusion, salve, tea, vinegar, or tincture. To make a poultice, chew up the plant and place it directly on a wound. You can also gently simmer the leaves in a little bit of water, let them cool, and place the warm herbs over the area, or saturate a dry wash cloth with the concentrated tea and place it over the skin.

**Traditional Technologies:** Alder bark is used to make an orange dye. It is harvested in spring through summer when the sun is actively shining on the tree at the warmest time of day. Alder wood is used in woodworking to make utensils, carvings, musical instruments, and other implements. The wood burns well and is prized for smoking salmon. It is clean-burning and non-crackling.



**Ecological Relationships:** Alder twigs are important food for deer, elk, and moose. Small birds eat the seeds and use the trees for cover and nesting. Beavers eat alder bark and use the branches for constructing their dams. Alder shades streams, rivers, and ponds, and helps protect fish and other wetland species. Alder groves



are very efficient at healing damaged land. The Forest Service previously sprayed poison on alder forests because they thought they were a trash tree, but now recognizes their ecological importance. Alder seeds are light (650,000 per lb) and can travel by wind to open soil that has been disturbed, such as the sites of clear cuts, fires, and slides. Seedlings may grow three feet in a single year!

Bacteria called Actinomycetes (genus *Frankia*) take residence on alder roots and stimulate the growth of nodules. Frankia bacteria fix nitrogen from the air and transfer it to the soil in exchange for some of the sugars from alder. This is a mutually beneficial partnership between roots and bacteria. Nitrogen is scarce in our Northwest soils and is an essential food for plant health. In addition, alder leaves fall when they are green and decompose rapidly to form rich humus. While alders only live about 100 years, they create fertile conditions for long-lived conifer trees to take root and develop into stable forests.



### **Additional Resources**

Alder Tend, Gather and Grow Vido with Anna Cook (Swinomish): Alder: <https://vimeo.com/571847275>

*Northwest Trees* by Arno and Hammerly

*The Boreal Herbal* by Beverly Gray

Blog post: <https://www.treesforcities.org/stories/intreeducing-the-alder-a-super-hero-tree-pioneer>

Garden Curriculum– Alder activity page 130: <https://www.mun.ca/botgarden/learn/fromgardentoclassroom.pdf>

### **References**

Arno, S. and Hammerly, R. (2007). *Northwest Trees*. The Mountaineers Books.

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Moore, M. (2003). *Medicinal Plants of the Mountain West*. Museum of New Mexico Press.

Schofield, J. (1989). *Discovering Wild Plants*. Alaska Northwest Books.

Turner, N. and Hebda, R. (2012). *Saanich Ethnobotany*. Victoria: Royal B.C. Museum Publishing.

# ALDER: COMMUNITY BUILDER

**Time:** 45 minutes  
**Season:** Spring through Fall  
**Age:** Grades K-5  
**Setting:** Indoor or Outdoor



**Overview:** Students learn about alder’s role in healing disturbed landscapes. In a game, students act out alder forest succession. Through exploring different parts of the alder tree and completing a drawing activity, students learn how to identify alder.

**Student Wondering:** *What is red alder? How does it contribute to the health of a forest community?*

Learning Objectives	
<b>Understandings</b> <i>Student will understand that...</i>	<b>Knowledge and Skills</b> <i>Student will be able to...</i>
<ul style="list-style-type: none"> <li>alder contributes to the health of a forest community.</li> <li>plants can help regenerate disturbed landscapes.</li> <li>plants are used for many purposes including food, medicine, and traditional technologies.</li> </ul>	<ul style="list-style-type: none"> <li>identify alder through characteristics including leaf margins, veins, opposite vs. alternate buds, etc.</li> <li>make an alder leaf rubbing.</li> </ul>

NGS Standards: Performance Expectations		
<ul style="list-style-type: none"> <li>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.</li> </ul>		
Scientific and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
<ul style="list-style-type: none"> <li>Developing and Using Models</li> </ul>	<ul style="list-style-type: none"> <li>LS1.B: Growth and Development of Organisms</li> </ul>	<ul style="list-style-type: none"> <li>Patterns</li> </ul>

**Vocabulary:** disturbance, germinate, nodules, fertile, decompose, humus, canopy, catkin, serrated

**Background:** Red alder grows in disturbed landscapes and helps to heal the soil from fire, landslides, clear cuts, and erosion. Seedlings grow as much as three feet per year and form lush groves that enrich the soil with nitrogen (an essential plant food) and offer protective shade, making it possible for other plants to grow. The Forest Service and timber companies once considered alder a “trash tree.” They worked to eradicate it in order to make space for conifers that are more economically valuable for human use. Alder’s value in forest ecosystems has only recently become more accepted by forest managers.

## Materials

- Alder plant samples: leaves, female and male catkins, small branches, roots with nodules, bark
- Hand lenses or magnifying glasses
- Drawing materials: paper or student notebooks, pencils, crayons for leaf rubbings
- Alder Role Cards for playing game. See end of document.
- Alder Lifecycle Page (to print or project if you are doing this activity inside).

**Preparation:** Read the *Alder Overview*. Gather enough samples from alder trees for each student group to have at least one of each type of plant sample (leaf, catkins, branches, etc.) Print and cut out Alder Role Cards so each student has a role.

## LESSON: ALDER - COMMUNITY BUILDER

### INTRODUCTION

10 MINUTES

If you are outside, have the class gather beneath an alder tree. If you are inside, project the Alder Lifecycle Page at the end of this document.

**Share:** (adapt the following information to fit the knowledge level of your students)

- Imagine there has been a great **disturbance** on this land. A fire has burned everything here, or perhaps the land has been clear-cut, a flood has swept away all the plant life, or a slide has carried away all the plants and topsoil. The earth is exposed. Shelter, food, and **nutrients** that many plants and animals rely on to survive have vanished.
- Along come tiny alder seeds, flying in the wind. They land on this disturbed soil and **germinate**. But they need help healing the soil so they can grow!
- Alder forms a partnership with special bacteria in the soil called *Frankia*. All plants need nitrogen in the soil to grow, just like we need nutrients from our food to grow, but when the soil has been disturbed, there isn't much nitrogen present. *Frankia* can do something amazing. *Frankia* can take nitrogen from the air and turn it into nitrogen in the soil!
- *Frankia* attaches to alder's roots and eats some of its food (plant sugars) in exchange for fixing nitrogen in the soil. It forms **nodules** that you can see when you dig up alder roots. Some are as big as your fist!
- Now alder is doing well in this **fertile** soil. New alder saplings can grow up to three feet per year. Imagine if you grew that much in a year!
- As alder grows taller, it creates a tall **canopy** of leaves. Each fall, the leaves drop to the ground and help provide cover for insects to live under. As the leaves **decompose**, they form **humus** that is a building block for healthy soil. Alder leaves build nitrogen, an important plant fertilizer, in the soil as they decompose.
- Alder trees create a shady home where other plants and animals can live. The seeds of evergreen conifer trees like hemlock and spruce are brought into the alder grove by the wind or by animals. These seeds will grow into trees even taller than alder. They also live longer - alders only live about 100 years whereas evergreen conifers can live many hundreds to a thousand years. Eventually evergreen conifer

forests replace alder forests. But alder seeds travel on the wind to another disturbed site, where they can help heal the soil and start a new forest!

**Think, Pair, Share:** Have students talk with a partner or form small groups. **Ask:** *What is community? What does it mean to build community? Why do people call alder a community builder?* Give students a few minutes to share back with the whole group.

### ALDER COMMUNITIES GAME

10 MINUTES

**Act It Out:** Students perform a short play, acting out the roles of alder forest succession. Pass out role cards and have students stand in an open area in classroom or a field. If you have a class of 15, have students take on the roles below.

- 1 disturbance event (clear the area for a new forest to grow)
- 4 alders (goal is to link with 2 bacteria)
- 8 bacteria (goal is to link with an alder)
- 2 conifers (goal is to surround yourself with alders for shade)

**Begin Play:** After explaining the goals for each card, teacher shouts (in order):

- "Disturbance - disturb!" (Student acts out clearing the land by moving students to the side of the area)
- "*Frankia* bacteria, disperse in the soil." (Students scatter within the field or classroom)
- "Alders, fly into the area and germinate. Find your bacteria and grow!" (Students link elbows with bacteria and grow)
- "Conifers, plant yourselves between alders and grow!" (Students place themselves in the alder forest)
- "Alders, fall down or have your seeds fly to another area." (Students fall down or leave forest area)
- "Disturbance, disturb!" (Student clears all actors from the forest area and the cycle starts over)

**Debrief:** Have a group discussion. **Ask:** *What did you learn?* Give students time to reflect.

**TEACHING TIP:** If you have more or less than 15 students, adjust the roles. The key to making the game successful is to have at least one disturbance event, one conifer tree, and twice as many bacteria as alder trees.

### DRAWING ACTIVITY

20 MINUTES

Pass out drawing utensils, paper, student notebooks or blank paper, hand lenses, and samples of alder including leaves, **catkins**, small branches, bark, and roots with bacteria nodules. Have students work in table groups or circles to share samples. Younger students can do leaf rubbings, while older students can do more complex drawings of plant parts and the whole plant in its ecosystem.

**Share:** We are going to take a close look at the different parts of alder including:

- Leaves – notice their **serrated** edges, veins, and different color on the top and bottom.
- Male catkins – these release pollen in early spring that fertilizes female catkins.
- Female catkins – some people call these alder berries. When woody, they look like miniature pinecones. Can you find any seeds if you shake the female woody catkins?

- Branches – notice that buds grow alternately along the stem.
- Bark – alder bark is grey and often has dark spots, moss, and lichen growing on it. If you cut the bark, it will turn a bright orange color. Alder bark is used for dye.
- Roots – look for nodules that contain *Frankia* bacteria. Can you see the nodules?

As you investigate alder, remember to use your senses and notice smell, texture, color, and more! Use a hand lens or magnifying glass to look closely at different parts. Encourage students to follow the ABCDE's of scientific drawing including:

A - Accurate

B - Big - use the whole page

C - Colorful or gives context

D - Detailed - use writing and drawing together. What do you notice about color, texture, shape, size?

E - Explained - "I notice... I wonder... this reminds me of..."

Group Reflection: After students take time to draw alder, bring them back together. **Ask**: *What do you notice?* (Name each type of sample and have students share what they notice. Reinforce vocabulary words).

#### TYING IT TOGETHER

10-20 MINUTES

**Share**: Our Forest Service manages our forests. They once thought that alder was a "trash tree," and worked to eradicate alder groves to make more space for evergreen trees that are harvested for lumber. Current forest managers are finally starting to understand the importance of alder in sustaining our forests.

Group Discussion or Reflective Writing: **Ask**: *What message are you going to give people who manage land about alder? What can people learn from alder?*

#### DIGGING DEEPER

Watch an Alder Video: <https://vimeo.com/571847275>

Write Love Letters to Alder: Have students pretend they are lichen, bacteria, another alder, an evergreen sapling, or an animal in the forest and write alder a love letter.

Alder Leaf Coloring Page: <http://www.supercoloring.com/coloring-pages/alder-leaves>

# ALDER: MAKING ALDER BARK DYE

**Time:** 1–3 hours  
**Season:** Any season  
**Age:** Grades 4–12  
**Setting:** Indoor or Outdoor (with a portable stove)



**Overview:** Students explore the use of alder bark as a dye. Students will be introduced to basic dye vocabulary as well as learn about the different ways to extract dye from the bark of an alder tree. They will also understand that dyes from different parts of the alder tree will produce different colors. Native Peoples from the Pacific Northwest have traditionally used the inner bark of red alder to dye masks, canoes, fishing nets, baskets, and weaving materials red-orange.

**Student Wondering:** *How can I produce natural dye from alder?*

Learning Objectives	
<p style="text-align: center;"><b>Understandings</b> <i>Students will understand that...</i></p> <ul style="list-style-type: none"> <li>red alder has been an important dye plant to Coast Salish people for many years.</li> <li>plant pigments play a critical role in the color outcome of plant dyes.</li> <li>natural dye attaches to plant and animal fiber differently.</li> <li>natural dye can be extracted using hot or cold water.</li> </ul>	<p style="text-align: center;"><b>Knowledge and Skills</b> <i>Students will be able to...</i></p> <ul style="list-style-type: none"> <li>identify red alder parts such as the leaves, bark, and cones.</li> <li>become familiar with creating dye from red alder bark.</li> <li>understand the difference between fiber from a plant and animal.</li> </ul>

NGS Standards: Performance Expectations		
<ul style="list-style-type: none"> <li>1-LS1-1. Use materials to design a solution to a human problem by mimicking how plants and/or animals use their external parts to help them survive, grow, and meet their needs.</li> </ul>		
Scientific and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
<ul style="list-style-type: none"> <li>Developing and Using Models</li> </ul>	<ul style="list-style-type: none"> <li>LS2.C: Ecosystem Dynamics, Functioning, and Resilience</li> <li>LS1.B: Growth and Development of Organisms</li> </ul>	<ul style="list-style-type: none"> <li>Stability and Change</li> <li>Patterns</li> </ul>

**Vocabulary:** natural dye, plant pigment, tannin, fiber

**Background:** Red alder bark, cones, twigs, and leaves can all be used to create a natural dye. The bark of red alder has been used by Coast Salish people to dye masks, canoes, fishing nets, baskets, and weaving materials.

### Materials

- Tools for harvesting and preparing bark including heavy clippers, pruners, or a hand saw and knives for stripping the bark.
- Large pot (stainless steel), spoon, strainer, and gloves. It is good practice to keep a set of pots, spoons, and a strainer that is used for dyeing purposes only.
- Fiber
- Alder bark for dye bath
- Alder leaves, bark (young and old), and cones as a sample for students to identify.

**Preparation:** Harvest plant material ahead of time, either with students, or on your own time.

## LESSON: ALDER BARK DYE

### INTRODUCTION

10 MINUTES

**Ask:** *What is a natural dye? What are natural dyes made from?* Give students a chance to respond. Fill in missing information including: **natural dye** generally refers to color extracted from plant material for the purpose of adding color to fibers like cotton, wool, paper, and basketry materials. Natural dye is extracted from plants as well as some insects, lichens, mushrooms, and even rocks or clay.

**Ask:** *Do you know what plant pigments are? Why do plants make them?* Give students a chance to respond.

**Share:** **Plant pigments** give color to leaves, flowers, and fruits and are important in plant processes such as photosynthesis, growth, and reproduction. There are different types of plant pigments. Plant pigments fall into several major chemical groups that are significant for natural dyeing including flavonoids and tannins. Alder tree bark, twigs, and cones are rich in **tannins**. The colors produced by tannins are mostly brown, reddish, or clear. Plants that are rich in tannins help fiber bind to dye, as well as enhance color saturation and longevity.

Pass around the parts of the alder tree. **Ask:** *What parts of the alder tree do you think can be used for dye?* Give students a chance to respond. Point out that the inner bark of red alder turns bright orange-red when exposed to air. This makes a bright orange to brown dye.

**Share:** Alder bark is used by Native People in the Pacific Northwest to color many things. Cedar bark and wood, including carvings, masks, totem poles, bark mats, baskets, and canoes, are dyed with alder. Alder bark is used to dye basketry materials, mountain goat wool, cloth, and other items. Animal skins are also traditionally tanned and dyed by soaking them in a cooled solution of alder bark. Alder is also used to make fishnets invisible to fish.

Alder cones, twigs, and leaves are used to make brown, green, and tan dyes.

**Ask:** *What is fiber?* Give students a chance to respond.

**Share:** **Fibers** are broken into two main categories:

- Plant fibers (or cellulose fibers) include cotton, linen, hemp, bamboo, etc.
- Animal fibers (or protein fibers) come from animal sources such as sheep, goat, or silk worms. Sheep create wool, goats create cashmere, and silk worms create silk.

Many fibers can be spun, knit, and woven together to make a fabric or textile. Fabrics and textiles are then sewn together to make the clothes we wear every day. Natural dye reacts differently with plant and animal fibers.

Animal and plant fibers will produce different shades and hues, even when dyed in the same dye bath.

Generally speaking, animal fibers are easier to dye. When dyeing with plants, it is best to stick with natural fibers as they hold the natural pigment better than synthetic fibers.

### HANDS-ON ACTIVITY

60-120 MINUTES

Harvesting tips: Where and when you harvest a plant material can affect the color and quality. Collect bark from older trees. Alder bark thickens with age. Fresh, thick bark will give a bright, strong color. Harvest from trees that are at least 6 inches in diameter for a deep orange-red color. It is best to harvest the bark in the late spring and summer when the sap is flowing and it is easier to peel. Some people harvest from the branches or trunk of live trees but alder bark can also be harvested from freshly, fallen trees and yield a great dye.

Preparing your dye material: Break up your plant material as much as possible by chopping, shaving, crushing, or grinding the bark. Breaking up your dye material creates more surface area, allowing the bark to release more pigment into your dye bath. If you are using thick bark from the trunk of an alder you can scrape the orangish-red inside of the bark with a pottery knife.



As a general rule you need as much plant material (by weight) as you have fiber. With alder bark, the more you gather, especially with cold-water extraction, the darker and more vibrant your dye bath. As you learn more about plant dyes, you will learn that each plant and plant dye is unique, and calls for different ratios of fiber to dye material. You will learn to make recipes that fit your project and season.

**Option 1 – Cold-water extraction:** Fill a large pot with bark chunks or bark shavings. The greater the surface area of the bark, the faster it will release color. Fill the rest of the pot with cool water. Put a lid on the pot and store in a cool, dry place out of direct sunlight and where it will not be disturbed. Alder bark is best left to soak in water overnight to release the dye. It can even be left for a few days to a week if you have time. Traditionally, urine was added to the soaking bark.

Preparing your fiber: As a general rule, dye will take better to clean fabric. This means removing oils, stains, and

residues before dyeing.

Using the dye bath: Before using your dye bath, use a strainer to separate the dye bath liquid from the bark. You should have enough liquid for your fiber to move freely in your pot. If you need more liquid, add more water to your pot. Submerge your fiber in water for at least 10 min before putting it in the dye bath. Wetting your fabric helps the dye adhere evenly to the fiber. Squeeze out any excess water and place your fiber in the dye bath. Put a lid on the pot and store in a cool, dry place out of direct sunlight and where it will not be disturbed. Stir the pot several times a day to move the fabric for even dyeing. Leave overnight or longer. When desired color on your fiber is reached, remove the fiber from the dye bath. Squeeze out extra dye liquid and gently rinse with cool water. Hang to dry. Cold-water extraction will yield more muted, pale orange colors.

**Option 2 – Hot-water extraction:** Fill a large pot with bark chunks or bark shavings. The greater the surface area of the bark, the faster the bark will release color. Fill the rest of the pot with cool water. Put the pot on the stove on medium heat. Simmer the bark for 1 hour. Try to not bring the dye bath to a full boil. It is best to extract the dye over low heat for a longer period of time than at a high heat for a shorter period. High heat can “zap” or dull the color of your dye.

Using the dye bath: Allow your dye bath to cool. Before using your dye bath, remove all bark material. Use a strainer to separate the dye bath from the bark. You should have enough liquid for your fiber to move freely in your pot. If you need more liquid, add more water to your pot. Submerge your fiber for dyeing in water for at least 10 minutes before putting it in the dye bath. Wetting your fabric can help the dye adhere evenly to the fiber. Squeeze out any excess water and place your fiber in the dye bath.

Place your pot with dye and fiber back on the stove. Put on medium-low heat and simmer for 45 minutes, or until desired color is reached (this can be shorter or longer). If dye bath starts to boil, reduce heat, or remove from heat until a simmer or low heat can be maintained. Stir the fiber in your dye pot frequently to move the fabric for even dyeing. High heat can “zap” or dull the color of your dye. High heat can also damage animal fibers like wool or silk.

When desired color on your fiber is reached, remove the fiber from the dye bath with tongs. Let cool. Squeeze out extra dye liquid and gently rinse with cool water. Hang to dry. Hot-water extraction will yield strong, orange-reddish colors.

### TYING IT TOGETHER

10 MINUTES

Show and Tell: Allow students to share their experience and results dyeing with red alder bark. *Was this the color you expected to get? Why or why not? What was surprising to you? What will you remember?*

### DIGGING DEEPER

Ethnography: Ask a parent or elder to tell you a story about how they use the red alder tree. Do they have a story of using red alder bark as a dye? Can you share something with them that you learned about the red alder tree?

Dye Experiments: Experiment with putting different types of fiber in the dye bath and compare results.

### **References for Beginner Dyers**

*Wild Color* by Jenny Dean

*The Art and Science of Natural Dyes* by Joy Boutrup and Catharine Ellis

*Harvesting Color* by Rebecca Burgess

*Natural Color* by Sasha Duerr

### **Resources**

This lesson was co-developed by Crescent Calimpong and Stephanie Knittel

Thanks to Yvonne Peterson (Chehalis Tribe) for teaching our *Tend* team about alder dye, and to by T. Abe-Lloyd for sharing knowledge.

Moerman, D. (1998). *Native American Ethnobotany*.

### Photos

Photos by Elise Krohn except bird eating alder seeds page 2 Dreamstime, and disturbance events on Alder Role Card accessed online.





ALDER TREE



ALDER TREE



ALDER TREE



ALDER TREE



DISTURBANCE EVENT



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CONIFER TREE



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alternate orientation on stems. In early spring, male catkins hang from leafless branches like fancy tassels and give the treetops a reddish flush. This is a sure sign that spring is just around the corner. Female catkins grow on the same tree. They are 1/2–3/4 inches in diameter and resemble pinecones that mature from bright green to woody brown. They contain tiny fruit (winged nutlets) that are built for wind travel. Both male and female catkins take a full year to develop. Alder is in the Betulaceae (birch) family.

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strip about the width of your hand so the tree continues to thrive. Separate the red inner bark from the tough outer bark. The inner bark offers the strongest medicine and the outer bark can be composted. You do not need to separate inner and outer bark from the smaller branches or twigs because the bark is so thin.

**Eating Alder:** Alder catkins are high in protein and are used as a survival food. Some indigenous people in the Pacific Northwest ate the inner bark of alder in springtime.

**Medicine:** Once considered a “trash tree” to the Forest Service, alder is underappreciated and underutilized. Alder tree communities take root in decimated places and reestablish harmony and richness in the landscape. Alder does this for human health as well by soothing inflammation, fighting infection, and promoting healing. The bark is most commonly used, but the leaf buds, mature leaves, and male and female catkins are also medicinal.

Alder is bitter and supports liver functions, such as the breakdown of wastes and formation of bile to assist with fat digestion. A tincture made from alder can help ease indigestion after a fatty meal. Alder is also antimicrobial and is used to treat internal and topical infections. Its astringent properties make it useful in tightening inflamed tissue. Skokomish elder Bruce Miller recommended alder bark tea for mouth ulcerations and sore throats. Skin disorders including acne and boils may respond well to both internal and topical use of alder. The leaves, catkins, and bark can be made into a bath, poultice, compress, decoction, oil infusion, salve, tea, vinegar, or tincture. To make a poultice, chew up the plant and place it directly on a wound. You can also gently simmer the leaves in a little bit of water, let them cool, and place the warm herbs over the area, or saturate a dry wash cloth with the concentrated tea and place it over the skin.

**Traditional Technologies:** Alder bark is used to make an orange dye. It is harvested in spring through summer when the sun is actively shining on the tree at the warmest time of day. Alder wood is used in woodworking to make utensils, carvings, musical instruments, and other implements. The wood burns well and is prized for smoking salmon. It is clean-burning and non-crackling.



**Ecological Relationships:** Alder twigs are important food for deer, elk, and moose. Small birds eat the seeds and use the trees for cover and nesting. Beavers eat alder bark and use the branches for constructing their dams. Alder shades streams, rivers, and ponds, and helps protect fish and other wetland species. Alder groves



are very efficient at healing damaged land. The Forest Service previously sprayed poison on alder forests because they thought they were a trash tree, but now recognizes their ecological importance. Alder seeds are light (650,000 per lb) and can travel by wind to open soil that has been disturbed, such as the sites of clear cuts, fires, and slides. Seedlings may grow three feet in a single year!

Bacteria called Actinomycetes (genus *Frankia*) take residence on alder roots and stimulate the growth of nodules. Frankia bacteria fix nitrogen from the air and transfer it to the soil in exchange for some of the sugars from alder. This is a mutually beneficial partnership between roots and bacteria. Nitrogen is scarce in our Northwest soils and is an essential food for plant health. In addition, alder leaves fall when they are green and decompose rapidly to form rich humus. While alders only live about 100 years, they create fertile conditions for long-lived conifer trees to take root and develop into stable forests.



### **Additional Resources**

Alder Tend, Gather and Grow Vido with Anna Cook (Swinomish): Alder: <https://vimeo.com/571847275>

*Northwest Trees* by Arno and Hammerly

*The Boreal Herbal* by Beverly Gray

Blog post: <https://www.treesforcities.org/stories/intreeducing-the-alder-a-super-hero-tree-pioneer>

Garden Curriculum– Alder activity page 130: <https://www.mun.ca/botgarden/learn/fromgardentoclassroom.pdf>

### **References**

Arno, S. and Hammerly, R. (2007). *Northwest Trees*. The Mountaineers Books.

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Moore, M. (2003). *Medicinal Plants of the Mountain West*. Museum of New Mexico Press.

Schofield, J. (1989). *Discovering Wild Plants*. Alaska Northwest Books.

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# ALDER: COMMUNITY BUILDER

**Time:** 45 minutes  
**Season:** Spring through Fall  
**Age:** Grades K-5  
**Setting:** Indoor or Outdoor



**Overview:** Students learn about alder’s role in healing disturbed landscapes. In a game, students act out alder forest succession. Through exploring different parts of the alder tree and completing a drawing activity, students learn how to identify alder.

**Student Wondering:** *What is red alder? How does it contribute to the health of a forest community?*

Learning Objectives	
<b>Understandings</b> <i>Student will understand that...</i>	<b>Knowledge and Skills</b> <i>Student will be able to...</i>
<ul style="list-style-type: none"> <li>alder contributes to the health of a forest community.</li> <li>plants can help regenerate disturbed landscapes.</li> <li>plants are used for many purposes including food, medicine, and traditional technologies.</li> </ul>	<ul style="list-style-type: none"> <li>identify alder through characteristics including leaf margins, veins, opposite vs. alternate buds, etc.</li> <li>make an alder leaf rubbing.</li> </ul>

NGS Standards: Performance Expectations		
<ul style="list-style-type: none"> <li>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.</li> </ul>		
Scientific and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
<ul style="list-style-type: none"> <li>Developing and Using Models</li> </ul>	<ul style="list-style-type: none"> <li>LS1.B: Growth and Development of Organisms</li> </ul>	<ul style="list-style-type: none"> <li>Patterns</li> </ul>

**Vocabulary:** disturbance, germinate, nodules, fertile, decompose, humus, canopy, catkin, serrated

**Background:** Red alder grows in disturbed landscapes and helps to heal the soil from fire, landslides, clear cuts, and erosion. Seedlings grow as much as three feet per year and form lush groves that enrich the soil with nitrogen (an essential plant food) and offer protective shade, making it possible for other plants to grow. The Forest Service and timber companies once considered alder a “trash tree.” They worked to eradicate it in order to make space for conifers that are more economically valuable for human use. Alder’s value in forest ecosystems has only recently become more accepted by forest managers.

## Materials

- Alder plant samples: leaves, female and male catkins, small branches, roots with nodules, bark
- Hand lenses or magnifying glasses
- Drawing materials: paper or student notebooks, pencils, crayons for leaf rubbings
- Alder Role Cards for playing game. See end of document.
- Alder Lifecycle Page (to print or project if you are doing this activity inside).

**Preparation:** Read the *Alder Overview*. Gather enough samples from alder trees for each student group to have at least one of each type of plant sample (leaf, catkins, branches, etc.) Print and cut out Alder Role Cards so each student has a role.

## LESSON: ALDER - COMMUNITY BUILDER

### INTRODUCTION

10 MINUTES

If you are outside, have the class gather beneath an alder tree. If you are inside, project the Alder Lifecycle Page at the end of this document.

**Share:** (adapt the following information to fit the knowledge level of your students)

- Imagine there has been a great **disturbance** on this land. A fire has burned everything here, or perhaps the land has been clear-cut, a flood has swept away all the plant life, or a slide has carried away all the plants and topsoil. The earth is exposed. Shelter, food, and **nutrients** that many plants and animals rely on to survive have vanished.
- Along come tiny alder seeds, flying in the wind. They land on this disturbed soil and **germinate**. But they need help healing the soil so they can grow!
- Alder forms a partnership with special bacteria in the soil called *Frankia*. All plants need nitrogen in the soil to grow, just like we need nutrients from our food to grow, but when the soil has been disturbed, there isn't much nitrogen present. *Frankia* can do something amazing. *Frankia* can take nitrogen from the air and turn it into nitrogen in the soil!
- *Frankia* attaches to alder's roots and eats some of its food (plant sugars) in exchange for fixing nitrogen in the soil. It forms **nodules** that you can see when you dig up alder roots. Some are as big as your fist!
- Now alder is doing well in this **fertile** soil. New alder saplings can grow up to three feet per year. Imagine if you grew that much in a year!
- As alder grows taller, it creates a tall **canopy** of leaves. Each fall, the leaves drop to the ground and help provide cover for insects to live under. As the leaves **decompose**, they form **humus** that is a building block for healthy soil. Alder leaves build nitrogen, an important plant fertilizer, in the soil as they decompose.
- Alder trees create a shady home where other plants and animals can live. The seeds of evergreen conifer trees like hemlock and spruce are brought into the alder grove by the wind or by animals. These seeds will grow into trees even taller than alder. They also live longer - alders only live about 100 years whereas evergreen conifers can live many hundreds to a thousand years. Eventually evergreen conifer

forests replace alder forests. But alder seeds travel on the wind to another disturbed site, where they can help heal the soil and start a new forest!

**Think, Pair, Share:** Have students talk with a partner or form small groups. **Ask:** *What is community? What does it mean to build community? Why do people call alder a community builder?* Give students a few minutes to share back with the whole group.

### ALDER COMMUNITIES GAME

10 MINUTES

**Act It Out:** Students perform a short play, acting out the roles of alder forest succession. Pass out role cards and have students stand in an open area in classroom or a field. If you have a class of 15, have students take on the roles below.

- 1 disturbance event (clear the area for a new forest to grow)
- 4 alders (goal is to link with 2 bacteria)
- 8 bacteria (goal is to link with an alder)
- 2 conifers (goal is to surround yourself with alders for shade)

**Begin Play:** After explaining the goals for each card, teacher shouts (in order):

- "Disturbance - disturb!" (Student acts out clearing the land by moving students to the side of the area)
- "*Frankia* bacteria, disperse in the soil." (Students scatter within the field or classroom)
- "Alders, fly into the area and germinate. Find your bacteria and grow!" (Students link elbows with bacteria and grow)
- "Conifers, plant yourselves between alders and grow!" (Students place themselves in the alder forest)
- "Alders, fall down or have your seeds fly to another area." (Students fall down or leave forest area)
- "Disturbance, disturb!" (Student clears all actors from the forest area and the cycle starts over)

**Debrief:** Have a group discussion. **Ask:** *What did you learn?* Give students time to reflect.

**TEACHING TIP:** If you have more or less than 15 students, adjust the roles. The key to making the game successful is to have at least one disturbance event, one conifer tree, and twice as many bacteria as alder trees.

### DRAWING ACTIVITY

20 MINUTES

Pass out drawing utensils, paper, student notebooks or blank paper, hand lenses, and samples of alder including leaves, **catkins**, small branches, bark, and roots with bacteria nodules. Have students work in table groups or circles to share samples. Younger students can do leaf rubbings, while older students can do more complex drawings of plant parts and the whole plant in its ecosystem.

**Share:** We are going to take a close look at the different parts of alder including:

- Leaves – notice their **serrated** edges, veins, and different color on the top and bottom.
- Male catkins – these release pollen in early spring that fertilizes female catkins.
- Female catkins – some people call these alder berries. When woody, they look like miniature pinecones. Can you find any seeds if you shake the female woody catkins?

- Branches – notice that buds grow alternately along the stem.
- Bark – alder bark is grey and often has dark spots, moss, and lichen growing on it. If you cut the bark, it will turn a bright orange color. Alder bark is used for dye.
- Roots – look for nodules that contain *Frankia* bacteria. Can you see the nodules?

As you investigate alder, remember to use your senses and notice smell, texture, color, and more! Use a hand lens or magnifying glass to look closely at different parts. Encourage students to follow the ABCDE's of scientific drawing including:

A - Accurate

B - Big - use the whole page

C - Colorful or gives context

D - Detailed - use writing and drawing together. What do you notice about color, texture, shape, size?

E - Explained - "I notice... I wonder... this reminds me of..."

Group Reflection: After students take time to draw alder, bring them back together. **Ask**: *What do you notice?* (Name each type of sample and have students share what they notice. Reinforce vocabulary words).

#### TYING IT TOGETHER

10-20 MINUTES

**Share**: Our Forest Service manages our forests. They once thought that alder was a "trash tree," and worked to eradicate alder groves to make more space for evergreen trees that are harvested for lumber. Current forest managers are finally starting to understand the importance of alder in sustaining our forests.

Group Discussion or Reflective Writing: **Ask**: *What message are you going to give people who manage land about alder? What can people learn from alder?*

#### DIGGING DEEPER

Watch an Alder Video: <https://vimeo.com/571847275>

Write Love Letters to Alder: Have students pretend they are lichen, bacteria, another alder, an evergreen sapling, or an animal in the forest and write alder a love letter.

Alder Leaf Coloring Page: <http://www.supercoloring.com/coloring-pages/alder-leaves>

# ALDER: MAKING ALDER BARK DYE

**Time:** 1–3 hours  
**Season:** Any season  
**Age:** Grades 4–12  
**Setting:** Indoor or Outdoor (with a portable stove)



**Overview:** Students explore the use of alder bark as a dye. Students will be introduced to basic dye vocabulary as well as learn about the different ways to extract dye from the bark of an alder tree. They will also understand that dyes from different parts of the alder tree will produce different colors. Native Peoples from the Pacific Northwest have traditionally used the inner bark of red alder to dye masks, canoes, fishing nets, baskets, and weaving materials red-orange.

**Student Wondering:** *How can I produce natural dye from alder?*

Learning Objectives	
<p style="text-align: center;"><b>Understandings</b> <i>Students will understand that...</i></p> <ul style="list-style-type: none"> <li>red alder has been an important dye plant to Coast Salish people for many years.</li> <li>plant pigments play a critical role in the color outcome of plant dyes.</li> <li>natural dye attaches to plant and animal fiber differently.</li> <li>natural dye can be extracted using hot or cold water.</li> </ul>	<p style="text-align: center;"><b>Knowledge and Skills</b> <i>Students will be able to...</i></p> <ul style="list-style-type: none"> <li>identify red alder parts such as the leaves, bark, and cones.</li> <li>become familiar with creating dye from red alder bark.</li> <li>understand the difference between fiber from a plant and animal.</li> </ul>

NGS Standards: Performance Expectations		
<ul style="list-style-type: none"> <li>1-LS1-1. Use materials to design a solution to a human problem by mimicking how plants and/or animals use their external parts to help them survive, grow, and meet their needs.</li> </ul>		
Scientific and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
<ul style="list-style-type: none"> <li>Developing and Using Models</li> </ul>	<ul style="list-style-type: none"> <li>LS2.C: Ecosystem Dynamics, Functioning, and Resilience</li> <li>LS1.B: Growth and Development of Organisms</li> </ul>	<ul style="list-style-type: none"> <li>Stability and Change</li> <li>Patterns</li> </ul>

**Vocabulary:** natural dye, plant pigment, tannin, fiber

**Background:** Red alder bark, cones, twigs, and leaves can all be used to create a natural dye. The bark of red alder has been used by Coast Salish people to dye masks, canoes, fishing nets, baskets, and weaving materials.

### Materials

- Tools for harvesting and preparing bark including heavy clippers, pruners, or a hand saw and knives for stripping the bark.
- Large pot (stainless steel), spoon, strainer, and gloves. It is good practice to keep a set of pots, spoons, and a strainer that is used for dyeing purposes only.
- Fiber
- Alder bark for dye bath
- Alder leaves, bark (young and old), and cones as a sample for students to identify.

**Preparation:** Harvest plant material ahead of time, either with students, or on your own time.

## LESSON: ALDER BARK DYE

### INTRODUCTION

10 MINUTES

**Ask:** *What is a natural dye? What are natural dyes made from?* Give students a chance to respond. Fill in missing information including: **natural dye** generally refers to color extracted from plant material for the purpose of adding color to fibers like cotton, wool, paper, and basketry materials. Natural dye is extracted from plants as well as some insects, lichens, mushrooms, and even rocks or clay.

**Ask:** *Do you know what plant pigments are? Why do plants make them?* Give students a chance to respond.

**Share:** **Plant pigments** give color to leaves, flowers, and fruits and are important in plant processes such as photosynthesis, growth, and reproduction. There are different types of plant pigments. Plant pigments fall into several major chemical groups that are significant for natural dyeing including flavonoids and tannins. Alder tree bark, twigs, and cones are rich in **tannins**. The colors produced by tannins are mostly brown, reddish, or clear. Plants that are rich in tannins help fiber bind to dye, as well as enhance color saturation and longevity.

Pass around the parts of the alder tree. **Ask:** *What parts of the alder tree do you think can be used for dye?* Give students a chance to respond. Point out that the inner bark of red alder turns bright orange-red when exposed to air. This makes a bright orange to brown dye.

**Share:** Alder bark is used by Native People in the Pacific Northwest to color many things. Cedar bark and wood, including carvings, masks, totem poles, bark mats, baskets, and canoes, are dyed with alder. Alder bark is used to dye basketry materials, mountain goat wool, cloth, and other items. Animal skins are also traditionally tanned and dyed by soaking them in a cooled solution of alder bark. Alder is also used to make fishnets invisible to fish.

Alder cones, twigs, and leaves are used to make brown, green, and tan dyes.

**Ask:** *What is fiber?* Give students a chance to respond.

**Share:** **Fibers** are broken into two main categories:

- Plant fibers (or cellulose fibers) include cotton, linen, hemp, bamboo, etc.
- Animal fibers (or protein fibers) come from animal sources such as sheep, goat, or silk worms. Sheep create wool, goats create cashmere, and silk worms create silk.

Many fibers can be spun, knit, and woven together to make a fabric or textile. Fabrics and textiles are then sewn together to make the clothes we wear every day. Natural dye reacts differently with plant and animal fibers.

Animal and plant fibers will produce different shades and hues, even when dyed in the same dye bath.

Generally speaking, animal fibers are easier to dye. When dyeing with plants, it is best to stick with natural fibers as they hold the natural pigment better than synthetic fibers.

### HANDS-ON ACTIVITY

60-120 MINUTES

Harvesting tips: Where and when you harvest a plant material can affect the color and quality. Collect bark from older trees. Alder bark thickens with age. Fresh, thick bark will give a bright, strong color. Harvest from trees that are at least 6 inches in diameter for a deep orange-red color. It is best to harvest the bark in the late spring and summer when the sap is flowing and it is easier to peel. Some people harvest from the branches or trunk of live trees but alder bark can also be harvested from freshly, fallen trees and yield a great dye.

Preparing your dye material: Break up your plant material as much as possible by chopping, shaving, crushing, or grinding the bark. Breaking up your dye material creates more surface area, allowing the bark to release more pigment into your dye bath. If you are using thick bark from the trunk of an alder you can scrape the orangish-red inside of the bark with a pottery knife.



As a general rule you need as much plant material (by weight) as you have fiber. With alder bark, the more you gather, especially with cold-water extraction, the darker and more vibrant your dye bath. As you learn more about plant dyes, you will learn that each plant and plant dye is unique, and calls for different ratios of fiber to dye material. You will learn to make recipes that fit your project and season.

**Option 1 – Cold-water extraction:** Fill a large pot with bark chunks or bark shavings. The greater the surface area of the bark, the faster it will release color. Fill the rest of the pot with cool water. Put a lid on the pot and store in a cool, dry place out of direct sunlight and where it will not be disturbed. Alder bark is best left to soak in water overnight to release the dye. It can even be left for a few days to a week if you have time. Traditionally, urine was added to the soaking bark.

Preparing your fiber: As a general rule, dye will take better to clean fabric. This means removing oils, stains, and

residues before dyeing.

Using the dye bath: Before using your dye bath, use a strainer to separate the dye bath liquid from the bark. You should have enough liquid for your fiber to move freely in your pot. If you need more liquid, add more water to your pot. Submerge your fiber in water for at least 10 min before putting it in the dye bath. Wetting your fabric helps the dye adhere evenly to the fiber. Squeeze out any excess water and place your fiber in the dye bath. Put a lid on the pot and store in a cool, dry place out of direct sunlight and where it will not be disturbed. Stir the pot several times a day to move the fabric for even dyeing. Leave overnight or longer. When desired color on your fiber is reached, remove the fiber from the dye bath. Squeeze out extra dye liquid and gently rinse with cool water. Hang to dry. Cold-water extraction will yield more muted, pale orange colors.

**Option 2 – Hot-water extraction:** Fill a large pot with bark chunks or bark shavings. The greater the surface area of the bark, the faster the bark will release color. Fill the rest of the pot with cool water. Put the pot on the stove on medium heat. Simmer the bark for 1 hour. Try to not bring the dye bath to a full boil. It is best to extract the dye over low heat for a longer period of time than at a high heat for a shorter period. High heat can “zap” or dull the color of your dye.

Using the dye bath: Allow your dye bath to cool. Before using your dye bath, remove all bark material. Use a strainer to separate the dye bath from the bark. You should have enough liquid for your fiber to move freely in your pot. If you need more liquid, add more water to your pot. Submerge your fiber for dyeing in water for at least 10 minutes before putting it in the dye bath. Wetting your fabric can help the dye adhere evenly to the fiber. Squeeze out any excess water and place your fiber in the dye bath.

Place your pot with dye and fiber back on the stove. Put on medium-low heat and simmer for 45 minutes, or until desired color is reached (this can be shorter or longer). If dye bath starts to boil, reduce heat, or remove from heat until a simmer or low heat can be maintained. Stir the fiber in your dye pot frequently to move the fabric for even dyeing. High heat can “zap” or dull the color of your dye. High heat can also damage animal fibers like wool or silk.

When desired color on your fiber is reached, remove the fiber from the dye bath with tongs. Let cool. Squeeze out extra dye liquid and gently rinse with cool water. Hang to dry. Hot-water extraction will yield strong, orange-reddish colors.

### TYING IT TOGETHER

10 MINUTES

Show and Tell: Allow students to share their experience and results dyeing with red alder bark. *Was this the color you expected to get? Why or why not? What was surprising to you? What will you remember?*

### DIGGING DEEPER

Ethnography: Ask a parent or elder to tell you a story about how they use the red alder tree. Do they have a story of using red alder bark as a dye? Can you share something with them that you learned about the red alder tree?

Dye Experiments: Experiment with putting different types of fiber in the dye bath and compare results.

### **References for Beginner Dyers**

*Wild Color* by Jenny Dean

*The Art and Science of Natural Dyes* by Joy Boutrup and Catharine Ellis

*Harvesting Color* by Rebecca Burgess

*Natural Color* by Sasha Duerr

### **Resources**

This lesson was co-developed by Crescent Calimpong and Stephanie Knittel

Thanks to Yvonne Peterson (Chehalis Tribe) for teaching our *Tend* team about alder dye, and to by T. Abe-Lloyd for sharing knowledge.

Moerman, D. (1998). *Native American Ethnobotany*.

### Photos

Photos by Elise Krohn except bird eating alder seeds page 2 Dreamstime, and disturbance events on Alder Role Card accessed online.





