

**EXPLORE YELLOWSTONE  
CHILDREN'S DISCOVERY CENTER**

# **PLANTS**

## **EDUCATOR GUIDE**



# **MUSEUM<sup>OF</sup> THE ROCKIES**

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Dear Educator,

Thank you for choosing to bring your students to the *Explore Yellowstone* Martin Children's Discovery Center at the Museum of the Rockies (MOR), where our mission is to inspire visitors to explore the rich natural and cultural history of America's Northern Rocky Mountains. A visit to the Discovery Center is a great way to help your students visualize concepts and spark their curiosity about a new topic.

Studies have shown that learning in museums is not limited to the time spent within their walls, but is heavily influenced by prior knowledge and experiences and continues long after the visit has ended. For these reasons, preparing your students for their museum visit and then extending their experience afterward will enhance the educational aspect of the field trip experience.

To aid you in linking this museum visit to your curriculum, the Museum of the Rockies' Education Department has created this guide. Inside, you will find details on the *Explore Yellowstone* Martin Children's Discovery Center, including a map of the exhibit and education goals. We have also assembled complementary classroom activities for various grade levels. We hope that these resources will help you prepare pre- and post-visit activities for your students that tie into your curriculum.

MOR is committed to providing the richest possible learning experience for your students and welcomes your questions and feedback. We look forward to seeing you at the Museum of the Rockies soon!

Sincerely,

Education Department  
Museum of the Rockies

## EXPLORE YELLOWSTONE GENERAL OVERVIEW

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Exhibit's Appropriate Age Levels: Birth through 8 years of age (or 2<sup>nd</sup> grade)

*Curriculum is appropriate for preschool through 5<sup>th</sup> grade students.*

Exhibit Overall Goal:

Introduce children to the wonders of Yellowstone National Park in a hands-on, immersive environment that empowers children to discover a lifelong passion for nature, science, and the Yellowstone experience.

Exhibit Description:

Explore Yellowstone is an immersive exhibit. From the moment kids enter through the Roosevelt Arch, they are surrounded by landscape scenes from Yellowstone. Murals surround them while overhead clouds float in the blue sky. In one area, children can “fish” with magnetic fishing poles for cutthroat and lake trout that have ball bearings sewn in their snouts and learn which fish to return to the “lake.” Mammoth terraces and bubbling mud pots help teach the concepts of thermal features and a “smell tube” lets them get a whiff of hydrogen sulfide. In the campground kids learn campground etiquette like bear-proofing food and removing litter or listen to stories and sing songs around the “campfire.”

A tot area, framed by murals of the Grand Canyon of the Yellowstone, gives infants a safe place to play while their parents watch from benches made of polished logs. Older kids can climb the fire tower and use binoculars to look for smoke, or play in a life-size eagle’s nest and learn about habitats.

In the lodge, children can dress up and pretend to be people working in Yellowstone. They can “cook” with an authentic wood stove that has a fake fire burning in the coal box or sit on child-size lodge pole furniture in front of the fireplace and read. A big clock over the fireplace helps them time the next eruption of “Old Faithful,” the largest of three cloth geysers. At the end of their visits, children can make post cards or drawings to take home before they exit through the Roosevelt Arch.

## Exhibit Layout:

Eight discovery zones, each with a focus on different area of Yellowstone, provide just enough design, detail and props to suggest a time and place for children to become a part of Yellowstone.



## BUILD A TREE

*Students will act out the parts of a tree*

### APPLICABLE AGES:

K – 6<sup>th</sup> grade

### LOCATION:

At the museum or in your classroom – wherever there is space to get into a large circle

### RESOURCES AND MATERIALS:

- Cards with each of the tree parts written on them

### PURPOSE:

This lesson will help students become familiar with the name and function of each part of a tree.

### OBJECTIVES:

Students will be able to:

1. Act out the various parts of a tree (lateral roots, heartwood, phloem, and xylem)
2. Describe how the various plant parts work for the tree's survival

### VOCABULARY:

Heartwood	Cambium
Xylem	Bark
Phloem	Lateral Roots

### ACTIVITY:

Assign each student to a role. Describe each role and set up the tree from the inside out. Explain the motion; put the student(s) in place, have each tree part do the action once or twice, then set up the next child or children.

Heartwood- stands tall as the inner core and strength of the tree,  
*Action: thumping their chest with their fist. Thu-thump, thu-thump*

Xylem- moves energy in the form of sugar, created through photosynthesis, from the top of the tree down;  
*Action: Hands in air moving in a shaking/wave fashion and then brought to the ground in a crouch saying "sugar sugar sugar"*

Phloem- brings the water up from the earth through the roots and trunk to the leaves for use in photosynthesis. *Action: Start in crouch and go straight up to sky, arms fully extended, with a sucking noise. Sssccccchhh.*

Cambium- is the invisible layer where the xylem and phloem cells are. *Action: Have the students do a building motion to show that it's the xylem and phloem together*

Lateral roots- suck up water using root hairs and are a support/anchor for the tree. *Action: Student lies on back with feet at base of tree making slurping noises to bring water into the tree. Slurp slurp.*

Bark- is the outer protective layer. *Action: Move around the tree barking to protect from all angles. Bark bark bark!*

**Complete Tree:** now that all the students are in place; have the whole tree do all of their noises and motions together as a collective a few times (usually until everyone starts laughing!)

## **TYING IT ALL TOGETHER:**

After everyone has stopped their actions and are sitting still, generalize about all plants: Do all plants have all the parts of a tree? How are other plants the same or different?

Compare plants to animals. What are the similarities and differences?

*Adapted from: Sharing Nature with Children "Build a Tree" p 62-66, Project Learning Tree; Activity 63 "Tree Factory" p 269-272 and Hands on Nature "A Tree Are We" p 131*

## **ADDITIONAL RESOURCES:**

Project Learning Tree Pre K-8 Environmental Education Activity Guide

**DRESS A TREE**

*Students will create tree parts out of craft materials and fix them to the skeleton tree*

**APPLICABLE AGES:**

K – 4<sup>rd</sup> grade

**LOCATION:**

At the museum or in your classroom

**RESOURCES AND MATERIALS:**

- Cards with a tree part written on it
- Skeleton tree (a two-inch-diameter stick)
- Construction paper
- Cloth scraps
- Pipe cleaners
- Styrofoam scraps
- Cardboard
- Scissors
- Glue
- Tape
- Yarn or string scraps
- Any other materials for building a tree

**PURPOSE:**

This lesson will help students become familiar with names and functions of the parts of a tree or plant.

**OBJECTIVES:**

Students will be able to:

1. Name the parts of a tree
2. Describe the function of each part in the tree's life

**VOCABULARY:**

Branch	Flower
Bark	Bud
Leaves	Fruit
Twig	Nut

**ACTIVITY:**

Place a two inch diameter vertical stick in front of the children. Explain that this represents a skeleton tree that needs dressing. Give each child a card with a tree part written on it: roots, bark, branches, twigs, leaves, buds, flowers, fruits/nuts. T

he children should make their assigned tree parts and when called upon, take them to the tree skeleton and help dress the tree.

As they place their part on the tree, they should tell what function it serves.

**EXTENSIONS:**

Pre-K students: Have pictures as well as vocabulary on the tree part cards

## PLANT KEY INVESTIGATION

*Students will observe and identify plants using graphic or written keys*

**APPLICABLE AGES:**

1<sup>st</sup> grade – 6<sup>th</sup> grade

**LOCATION:**

At the museum

**RESOURCES:**

- Copies of either the graphic key or the written key, depending on the age and abilities of the students (Keys can be shared in small groups or handed out individually.)

**PURPOSE:**

This lesson will encourage observation of plant characteristics and familiarize students with dichotomous keys.

**OBJECTIVE:**

Students will:

1. Observe various plant characteristics
2. Identify the types of plants in the Explore Yellowstone Martin Children’s Discovery Center
3. Use a dichotomous key

**ACTIVITY:**

This is a dichotomous key. A dichotomous key helps you identify something using a series of questions that bring you to the right answer. The word dichotomy means “division of two.” Use the key to determine what types and kinds of plants are in the Explore Yellowstone exhibit.

**TYING IT ALL TOGETHER:**

Discuss what other characteristics might you see or find when looking at plants. Which of those characteristics would be useful to identify plants? How does a person tell plants apart from each other?

**EXTENSIONS:**

Have the students create a dichotomous key with themselves. Ask: What characteristic could they start with? (hair color, boys/girls, tall/short, etc). What could be the next characteristic? If possible, create a key that would end up with each student individually identified. A large piece of paper or white board is a good tool to write the key down on.

**START HERE:**

1. Are stems or other parts of the plant woody and rigid like a tree?  
Yes.....Go to 3.  
No.....Go to 2.
2. Does the plant grow in slender, single stems?  
Yes.....It is a **GRASS**.  
No.....Go to 3.
3. Does the plant have one or more hard, woody stems?  
Yes.....Go to 4.  
No.....Go to 8.
4. Is the plant usually 8 feet tall or taller?  
Yes.....It is a **TREE**: What kind? Go to 5.  
No.....Go to 7.
5. Does the plant have a grayish white trunk and round green leaves?  
Yes.....It is an **Aspen**.  
No.....Go to 6.
6. Does the plant have a brown trunk with rough bark?  
Yes.....It is a **Pine**.  
No.....Go to 7.
7. Does the plant have more than one main stem?  
Yes.....It is a **SHRUB**.  
No.....Start over.
8. Is the plant a soft, flowering plant?  
Yes.....It is a **FORB**.  
No.....Start over.

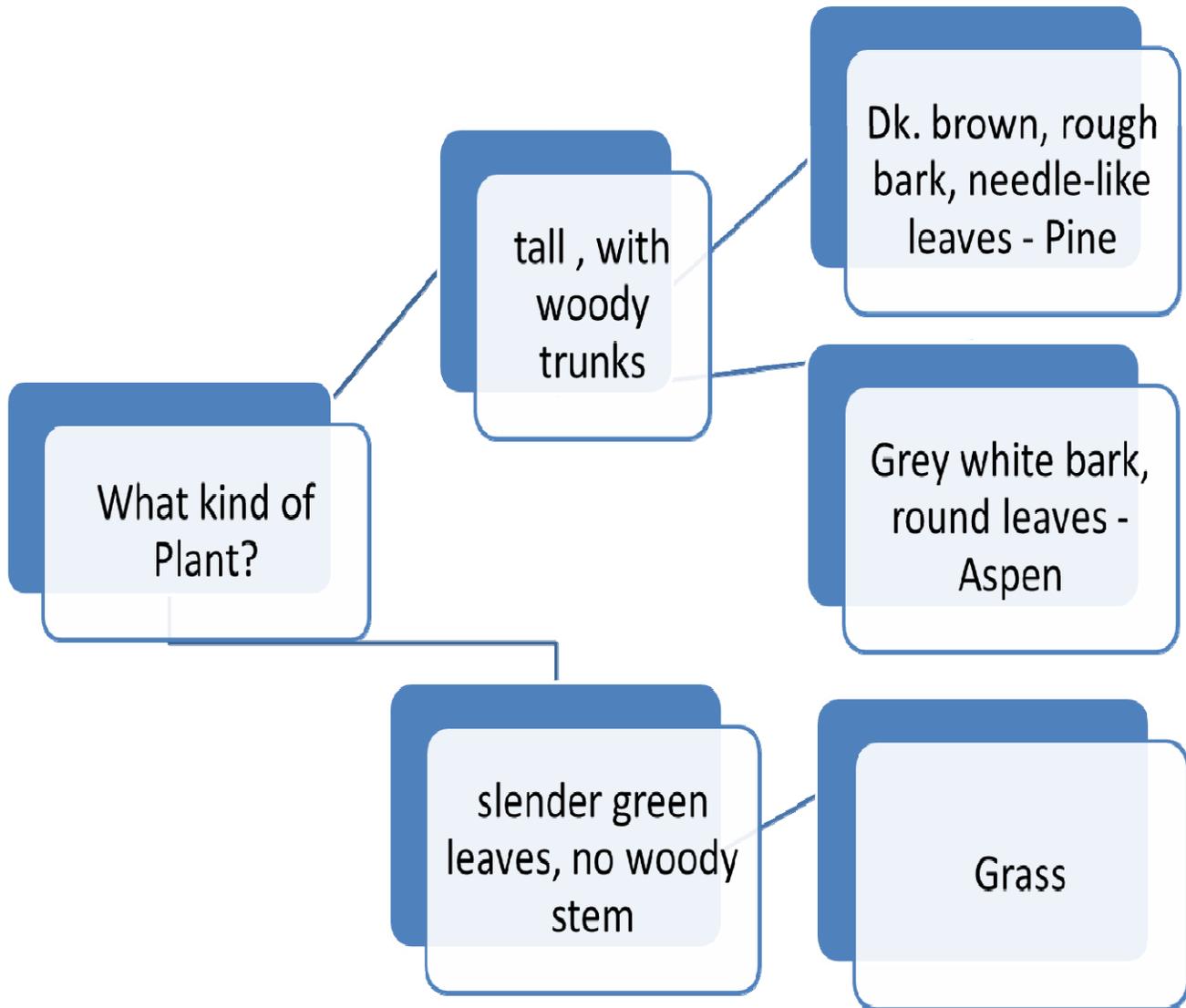
**EXPLORE YELLOWSTONE**

Name: \_\_\_\_\_

**DICOTOMOUS KEY FOR PLANTS**

PLANT TYPE	PLANT DESCRIPTION	SKETCH OF PLANT

**EXPLORE YELLOWSTONE**  
**DICOTOMOUS KEY FOR PLANTS**



## MEET A TREE

*Each student leads a blind-folded student to a tree to touch and discover.*

### APPLICABLE AGES:

Pre K – 6<sup>th</sup> grade

### LOCATION:

At the museum or outside in an open woody area with a number of easily accessible trees

### RESOURCES AND MATERIALS:

- Enough blindfolds for half of the group

### PURPOSE:

Students will develop a sense of relationship to a tree through the senses.

### OBJECTIVES:

Students will be able to:

1. Use their sense of touch to explore a tree blindfolded
2. Distinguish their tree from others by correlation data from all their senses with their sense of touch
3. Describe sensory details from one particular tree

### VOCABULARY:

None

### ACTIVITY:

Have the group divide up into teams of two and then one partner is blindfolded and led around by the seeing partner. (How far will depend on the partner's age and ability to orientate themselves. For all but very young children, a distance of 20-30 yards usually isn't too far.) Help the "blind" child to explore his tree and to feel its uniqueness. Specific suggestions for exploring are best.

When one partner is finished exploring, lead him back to where you began, but take an indirect route.

Now, remove the blindfold and let the child try to find the tree with his eyes open. Suddenly, as the child searches for his tree, what was a forest becomes a collection of very individual trees.

### TYING IT ALL TOGETHER:

When everyone has had the opportunity to discover their own tree, collect as a group and have students share their experiences.

### EXTENSIONS:

Offer students the opportunity to write about their experiences and/or their tree. Give them materials to draw and color their tree. Show examples of poems such as haiku or diamante and ask them to write their own poem about their tree.

*Adapted from Sharing Nature with Children p.26-Joseph Cornell; Project Seasons, Shelburne Farms, pg 107; Hands On Nature, pg. 132*

## NOXIOUS WEED TAG

### (LEAFY SPURGE BONANZA: A 2-PART ACT)

*A rousing game of tag between native plants and introduced weeds, with a moth bio-control added in*

**APPLICABLE AGES:**  
2<sup>nd</sup> grade – 5<sup>th</sup> grade

**LOCATION:**  
At the museum, classroom or outside in an open area

**RESOURCES AND MATERIALS:**

- A white board or piece of paper to keep track of the rounds of play
- Optional: A bandana or other item to identify the initial Spurge Hawk Moth

**PURPOSE:**

This lesson will illustrate to students the rapid effects of noxious weeds on native species, and the positive results of bio-control agents.

**OBJECTIVES:**

Students will be able to:

1. Describe the characteristics of noxious weeds
2. Explain about bio-controls
3. Name at least one noxious weed and one bio-control agent

**VOCABULARY:**

Noxious weed	Spurge Hawk Moth
leafy spurge	Bio-control agent
	Native plant

**ACTIVITY:**

*\*Note: Native plants are the plants that were here in Montana prior to Euro/American settlement.*

**Part 1:**

Line all participants on one side of the playing field. Explain that they represent native Montana plants/grasses such as: bitterroot, heartleaf Arnica, blue grama, and Idaho fescue. Select one person to be the noxious weed “leafy spurge”. Explain that when the instructor yells “leafy spurge” the native plants and grasses must quickly walk to the other side of the field and avoid being tagged by the leafy spurge. If they are tagged the native grasses become the leafy spurge and they can also tag the remaining native plants as they cross the field. All the native plants will quickly become leafy spurge after a few rounds. After everyone has become leafy spurge again line the participants up on one side of the field.

\*Keep track of how many crossings it took until all the native plants became leafy spurge. Bring the rapid rate of change from native to non-native to the group’s attention.

**Part 2:**

Begin the next round with a quick discussion about noxious weed control (pesticides, pulls, and bio controls).

Introduce one biological control the Spurge Hawk Moth (SHM) larvae (caterpillar), and select one person to be the SHM. Explain that the SHM will eat leafy spurge and as the leafy spurge crosses the field they must avoid being tagged by the SHM. If they are tagged they become part of the SHM by joining hands with the growing caterpillar. Only the head or initial person can tag leafy spurge as they migrate from one side of the field to the other, and the tag only counts if chain of people forming the SHM is unbroken. Play for multiple rounds and typically not all the leafy spurge will be consumed by the SHM.

Ask the group to again line up on one side of the field and discuss their observations (not all the leafy spurge was consumed, and it took a long time for the SHM to consume just a portion of the leafy spurge)

*Note: Leafy spurge is very bitter and has few predators here in MT. Many animals and insects cannot consume leafy spurge. As the Spurge Hawk Moth larvae consume the leafy spurge they store up poisons from the plant. When predators attack the SHM the larvae puke up a toxic green slime to avoid being eaten.*

**TYING IT ALL TOGETHER:**

When finished with the game, bring everyone together to discuss what happened during the two rounds and how each round differed from the other. Analyze what impact the Spurge Hawk Moth (SHM) had on the leafy spurge population. Speculate about the effectiveness of the SHM over time, and the effectiveness of bio-controls in general. (Bio-controls are agents that makes a slow but permanent impacts on populations, and are non-toxic or non-interfering with other life forms)

**EXTENSIONS:**

Graph the results of the rounds of play in part 1 and part 2.

Research other bio-controls and analyze their impacts on populations.

Research benefits and draw-backs of bio-controls versus chemical control agents

*Adapted from BugwoodWiki: [BioControl in your Backyard](http://wiki.bugwood.org/Art); <http://wiki.bugwood.org/Art>*

## TREE COOKIES

*Tree rings provide a look at a tree's life and times*

### APPLICABLE AGES:

2<sup>nd</sup> grade – 6<sup>th</sup> grade

### LOCATION:

At the museum or in your classroom

### RESOURCES AND MATERIALS:

- Cross-sectional slices from tree trunks or limbs
- For Extension: White paper plates with wavy edges, Crayons

### PURPOSE:

This lesson will give student the opportunity to examine the interior of a tree, learn the names of different cells structures of trees, and determine how old the tree was when it was cut down.

### OBJECTIVES:

Students will be able to:

1. Describe the characteristics of different types of tree rings
2. Explain how environmental conditions affect tree growth
3. Count tree rings and make predictions

### VOCABULARY:

Heartwood	Phloem
Xylem	Cambium
	Bark

### ACTIVITY:

Discuss with the class how humans keep track of how old they are. Explain that trees also have a record of their ages. Show students a tree cookie. Explain that foresters call these cross sections “tree cookies.” Can the students tell how their tree kept track of its age? Have students work in pairs. Give each pair a magnifying glass and a tree cross-section. Let them observe their tree cookie and identify any special features they see.

After the students have examined their tree cookies, discuss their findings. Ask them to explain how they think trees keep track of their ages.

Explain that each year a tree grows wider by making new wood. When the tree starts growing in the spring, the new wood cells are very big and appear light in color. These light color bands of wood, visible in the tree cookies are called spring wood. The wider the band, the more the tree grew. Later in the year, when the tree growth starts to slow down, the new wood cells are smaller and closer together. These appear as dark rings in the tree cookies and are called summer wood. Every dark ring of summer wood marks the end of one year's growth.

### TYING IT ALL TOGETHER:

Explain that the number of rings in their tree cookies corresponds to the number of years the tree has been growing. How can they determine the age of their tree? (Count the dark rings. The total will equal the tree's age.) Have each group approximate how old their tree is.

### EXTENSIONS:

My Life as a Tree: Using white paper plates with ridges, demonstrate how a tree cookie can be drawn on the plate; using the bumpy edge as bark, the smooth inside edge as the cambium, and the center circle as the heartwood.

Hand out crayons and a plate to each student. Have them create a tree cookie of their lives, with a drawn circle for each year. Significant events in their lives can be indicated with a change of color or a marker of some type. Students can explain their tree cookies if they or you choose to. (These can be quite personal, though). Students can write autobiographies from their tree cookies.

*Adapted from: Project Seasons, Shelburne Farms, pg. 123; Project Learning Tree Pre k-8 Environmental Education Guide, Activity 76, p 327-331*

FEEDBACK

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Please contact the Education Department with any questions, comments or suggestions regarding this curriculum.

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