10. Tree Identification: Using a Key to Identify "Mystery Trees"

Lesson Overview: In this activity, students examine botanical specimens of tree species and learn to use a dichotomous key to identify them.

Lesson Goal: Students will understand that tree species are diverse and one can identify trees by looking at them carefully.

Objectives:

- Students can use a key to determine the tree species from a collection of images and specimens.

Subjects: Science, Mathematics (logic), Writing, Speaking and Listening

Duration: One half-hour session

Group size: Whole class, possibly working in teams of 2-3

Setting: Classroom

New FireWorks vocabulary: *bundle, key*

Standards:		1st	2nd	3rd	4th	5th
Common Core ELA	Reading: Informational Texts	4	4	4	4	4
	Writing	8	8	7,8	7,8	7,8
	Speaking/Listening	3,6	3,4,6	2,3,4,6	2,4,6	2,4,6
	Language Standards	1,2,4,5,6	1,2,4,5,6	1,2,4,5,6	1,2,4,5,6	1,2,4,5,6
NGSS	Structure, Function, and Information Processing	LS1.A, LS1.D			LS1.A	
	Inheritance/Variation of Traits			LS1.B, LS3.B		
	Matter and Energy in Organisms and Ecosystems					PS3.D
	Interdependent Relationships in Ecosystems		LS4.D	LS4.C		
EEEGL	Strand 1	A,C,E,F,G				A,C,E,F,G
	Strand 2	C				

Teacher Background: A wildland ecosystem is characterized by diversity, and the diversity of tree species is an important characteristic of forests. To understand the complexity of fire's role in forests, students must be able to distinguish among tree species. In this activity, they learn how to use a dichotomous key to identify 12 of the important trees in Sierra Nevada montane forests. You will work together as a class to identify 1 species from photos and botanical specimens provided in the trunk. Then the students will visit 11 stations, each with specimens from 1 species, and use the key to identify them.

This activity requires reading skill. For early elementary students, do the activity together as a class using student teams:

- Project **Handout E10-1: Identify 12 Trees**.
- Provide a set of specimens (tree bark/trunk, cone or flower, foliage, photo collection) to each student team.
- Read the questions on the key together as a class.
- Have student teams examine the specimens, raise their hands when they can answer "yes" to a question for their species, and thus move through the key together and determine the correct species.

Code letters for the tree species:

Baker cypress	A
California black oak	C
California red fir	S
Canyon live oak	P
Douglas-fir	E
Incense-cedar	J
Jeffrey pine	K
Ponderosa pine	Q
Quaking aspen	B
Sierra lodgepole pine	M
Sugar pine	T
White fir	X

The dichotomous key in **Handout E10-1: Identify 12 Trees** can also be used in the field, so this activity can prepare students for a field trip. If you want to test their knowledge in the field, find an area with several of these tree species represented, label the trees with the letter codes here, and have students fill in the handout as they move from tree to tree. In preparing the students, let them know that they are not likely to find EVERY species in the key living in one place, and they are likely to find species that are NOT in the key.

NOTE: This key will not work well in winter because some trees will lose their leaves.

Materials and preparation:

- Print 1 copy/student of **Handout E10-1: Identify 12 Trees** (two pages – print 2-sided, if possible).
- Project **Handout E10-1: Identify 12 Trees**.

- Find the following materials for species Q (ponderosa pine) and place them at your desk. All of these materials are in the trunk.

  Tree bark/trunk specimen
  Cone or flower specimen
  Foliage specimen
  Photo collection for the species (e-copy available: E10_TreePhotoPacket.pdf)

- Assemble 11 stations in the classroom, each containing all of the materials for one species.

Procedure:

1. Ask: Can you name any tree species that live in the Sierra Nevada? When you see this tree in the woods or on a mountainside, how do you know what kind it is – that is, how can you identify it? Open-ended discussion. You could note species names & 1-2 characteristics on the board.

2. Explain: Today we'll add to what you already know by learning how to use a *key* to identify tree species. By the end of class, you'll be able to identify 12 species that live in Sierra Nevada forests. This key is not just useful for identifying dead tree parts in the classroom. Once you know how to use the key, you can take it into the forest and identify trees in the field. We'll identify one species together, and then you will do the 11 others at stations.

3. Give each student a copy of **Handout E10-1: Identify 12 Trees**

4. Project **Handout E10-1**. Starting at the left side of the key, work with the students to identify tree "Q," ponderosa pine. As you do this together, students will see how to identify a tree based on characteristics of the leaves, bark, cones, flowers, etc. Make these points:

   - When you're using the key, you always have to start at the left box; you can't start identifying a species in the middle of the key.

   - Once you think you've made an identification, you must check your specimen against the species description on the back of the handout. Why? This key has only 12 species, but there are many more in the field. You'll need the extra clues to make sure you've got the species right.

   - When you've made and confirmed an identification, enter the letter of the specimen in the box with the species name.

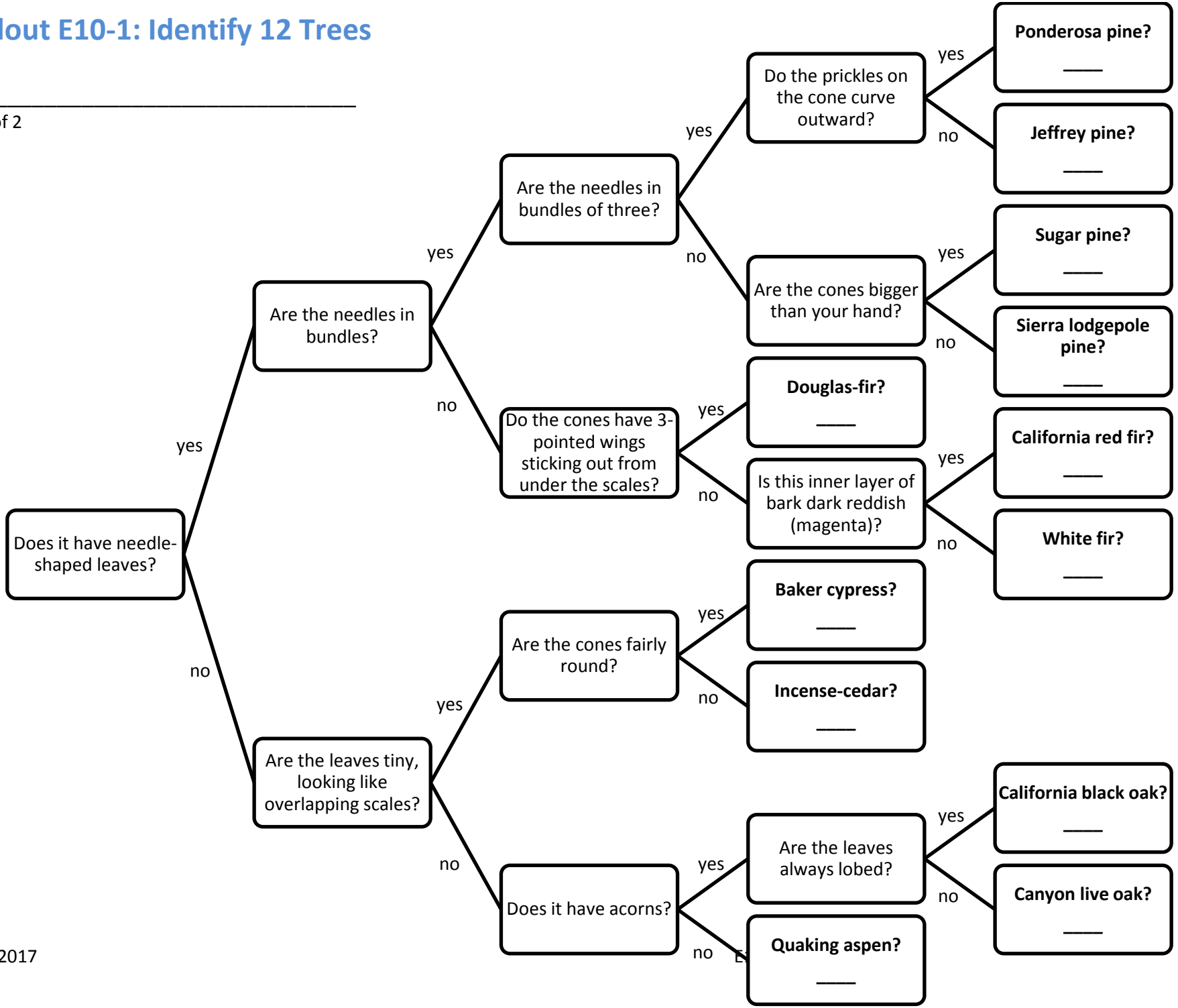
Assessment:
Have students circulate from one station to another (order doesn't matter), identify the tree species at each station, and enter the correct code letter for each species in the handout.

Evaluation:

Full Credit	Partial Credit	Less than Partial Credit
-Student correctly identified 8-12 species	-Student correctly identified 4-7 species	-Student correctly identified less than 4 species

Handout E10-1: Identify 12 Trees

Name_____



1. **Baker cypresses** have tiny leaves that look like overlapping scales. The trees' bark is thin and reddish-brown. The cones are round and are sealed closed by a hard, waxy coating.
2. **California black oaks** have leaves with "lobed" (curvy) edges. The leaves fall off each winter. Adult trees have thick, rough bark. California black oak trees produce acorns.
3. **California red firs** have short needles and brown, furrowed bark. If you break off a chunk of bark, you will see a deep red color. The cones are on the top of the tree, and they stick straight up. The cones fall apart easily, so you rarely see whole cones on the ground. California red fir needles are typically shorter than those of white fir.
4. **Canyon live oak** leaves are often oblong and have smooth edges, but they can also have pointy teeth along their edges. The leaves are evergreen, so they do not fall off in the winter. The trees' bark is thin and flaky. Like all oaks, canyon live oak trees produce acorns.
5. **Douglas-firs** have short, flat needles and brown, furrowed bark. The buds at the ends of their twigs are pointy. Their cones have little, 3-pointed "wings" that stick out from under the cone scales. It looks like tiny mice are trying to burrow in, but they can't hide completely!
6. **Incense-cedar** leaves look like overlapping scales, and their twigs look a little like fern fronds. Adult trees have thick, reddish-brown bark with deep furrows. Narrow strips hang loose from the trunk. Small, male cones form at the tips of the leaves. Female cones look like stiff brown flowers when they open at the end of the summer.
7. **Jeffrey pines** have long needles that usually grow from the twig in *bundles* of 3. Their cones are big. The cones have prickles that point inward. The trees' bark is yellowish or brown, sometimes even orange. It falls off in pieces that look like they belong in a jigsaw puzzle. Jeffrey pines produce a vanilla-like smell, especially in the springtime. Jeffrey pine needles and cones are typically bigger than those of ponderosa pine.
8. **Ponderosa pines** have long needles that usually grow from the twig in bundles of 3. Their cones are big. The cones have prickles that point outward. The trees' bark is yellowish or brown, sometimes even orange. It falls off in pieces that look like they belong in a jigsaw puzzle. Ponderosa pines produce a vanilla-like smell, especially in the springtime.

"Gentle Jeffrey, prickly ponderosa."

9. **Quaking aspens** have roundish leaves with a pointed tip. Their leaves move almost constantly because they are very sensitive to wind. The leaves turn yellow and fall off in the fall. The trees' bark is mostly grayish-white and smooth, although old trees can have furrowed bark down near the ground. Aspen seeds are packaged with cottony fluff that helps them float long distances on wind and water.
10. **Sierra lodgepole pines** have needles that grow from the twig in bundles of two. They have fairly thin, rough bark. The cones are about as long as the needles, and they open when their seeds are ripe. Sierra lodgepole pines grow high in the mountains.
11. **Sugar pines** have needles that grow from the twig in bundles of five. They grow tall and have thick, furrowed, reddish-brown bark. Their cones are very long, often longer than a 30 centimeters. Their branches spread wide from the trunk.
12. **White firs** have short needles. The bark on young trees is gray and smooth. The bark on old trees is gray with deep furrows that have orange streaks inside. If you break off a chunk, you will see a yellowish or orange color. Cones are on the top of the tree, and they stick straight up. The cones fall apart easily, so you rarely see whole cones on the ground. White fir needles are typically longer than those of California red fir.

Handout E10-1: Identify 12 Trees Answer Key